# SUSTAINABLE DEVELOPMENT GOALS AND WATER INSECURITY IN BALOCHISTAN: A CASE STUDY OF QUETTA CITY

**By**

**Karman**

**NATIONAL UNIVERSITY OF MODERN LANGUAGES ISLAMABAD**

**November 2021**

# SUSTAINABLE DEVELOPMENT GOALS AND WATER INSECURITY IN BALOCHISTAN: A CASE STUDY OF QUETTA CITY

By
**Karman**

M.Phil Pakistan Studies, 2021

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

**MASTER OF PHILOSOPHY**

In **Pakistan Studies**

To

FACULTY OF SOCIAL SCIENCES


NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD

November 2021

NATIONAL UNIVERSITY OF MODERN LANGUAGES
FACULTY OF SOCIAL SCIENCES

# THESIS/DISSERTATION AND DEFENSE APPROVAL FORM

**The undersigned certify that they have read the following thesis, examined the defence, are satisfied with the overall exam performance, and recommend the thesis to the Faculty of Social Sciences for acceptance:**

**Thesis/ Dissertation Title: SUSTAINABLE DEVELOPMENT GOALS AND WATER INSECURITY IN BALOCHISTAN: A CASE STUDY OF QUETTA CITY**

**Submitted By:** Karman **Registration #:** _____

_____

Pakistan Study (Social Sciences)
_____

**Dr. Fazal Rabbi**
Name of Research Supervisor

_____
Signature of Research Supervisor

_____
Name of Dean (FSS)

_____
Signature of Dean (FSS)

_____
Name of Director General

_____
Signature of Director General

_____

# CANDIDATE DECLARATION FORM

(Declaration Form to be filled in by Candidate at the time of Submission of Thesis to the Supervisor for Internal and External Evaluation. Follow this pattern strictly, and also let the dotted lines appear on the page)

I _____Karman_____

S/o _____Nazar Muhammad_____

Registration # _____

Discipline ___Social Science_____

Candidate of _____Pakistan studies_____ at the National University of Modern Languages do hereby declare that the thesis (Title) SUSTAINABLE DEVELOPMENT GOALS AND WATER INSECURITY IN BALOCHISTAN: A CASE STUDY OF QUETTA CITY Submitted by me in partial fulfillment of MPhil degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in future, be submitted by me for obtaining any other degree from this or any other university or institution.

I also understand that if evidence of plagiarism is found in my thesis/dissertation at any stage, even after the award of a degree, the work may be cancelled and the degree revoked.

_____
Signature of Candidate

_____
Date

_____Karman_____
Name of Candidate

# SUSTAINABLE DEVELOPMENT GOALS AND WATER INSECURITY IN BALOCHISTAN: A CASE STUDY OF QUETTA CITY


## Abstract

*The dilemma of water insecurity can exert extreme pressure on the least developed countries. Sustainable Development goal 6 asks for the Sustainable water availability for drinking and domestic use and also calls for sanitation. It proclaims that water scarcity is one of the major crisis in the world. It can be concluded that all other goals are directly connected with goal 6. Water insecurity can further increase the fringe elements in the society thereby giving rise to social and economic problems. The study focusing on Balochistan and then extrapolated into Quetta district shows alarming results. Prevalent structure and culture is severely disturbed due to water scarcity. Mass urbanization, rise in population and agriculture have reduced the ground water manifolds. This in turn led to the phenomenon of water insecurity. Mass migration and decrease in water table has led to many social and economic problems in Quetta district. Mass migration led to rise in the population therefore disturbing the economic equilibrium of the Quetta district. Moreover, due to migration a rift is created among indigenous population and the migrants also referred as refugees. More over more population has a burdening effect on the water table. These factors result in the problems like rampant chaos, violence and terrorism. Water insecurity has and can play a drastic role in disturbing the stability of the Quetta district.*



**Key Words:** Sustainable development goals, water insecurity, socio-economic development, environmental degradation, Quetta City - Balochistan.

# Table of Content

**Chapters** **Page No.**

# List of Abbreviation

| | |
|---|---|
| UNO | United Nations Organization |
| UNICEF | United Nations International Children's Emergency Fund |
| GWI | Global Water Institute |
| UNDP | United Nations Development Programme |
| SDG | Sustainable Development Goals |
| WB | World Bank |
| FAO | Food and Agriculture Organization |
| BUITEMS | Balochistan University of Information Technology, Engineering and Management Sciences |
| PLBB | Pishin Lora Basin of Balochistan |
| IWSA | International Water Supply |
| IWA | International Water Association |
| IWSA | International Water Supply Association |
| IWW | Industrial waste water |
| IPPC | Integrated Pollution Prevention and Control |
| UAE | United Arab Emirates |
| SD | Sustainable Development |
| WCED | World commission on Environment and Development |
| MDGs | Millennium Development Goals |
| COVID-19 | Corona Virus Disease 2019 caused by SARS-CoV-2 |
| WHO | World Health Organization |
| CO2 | Carbon Dioxide |
| ASD | Advance Sustainable Development |
| ADB | Asian Development Bank |
| JMP | Joint Mission Planning |
| IMF | International Monetary Fund |
| PCRWR | Pakistan Council of Research in Water Resources |
| MMBTU | Metric Million British Thermal Unit |
| WAPDA | Water and Power Development Authority |

| | |
|---|---|
| HP | Horsepower |
| SDI | Subsurface Drip Irrigation |
| TWW | Treated Wastewater |
| QESCO | Quetta Electric Supply Company |
| QWSA | Quetta Water and Sanitation Agency |
| WDR | World Development Report |
| WASA | Water and Sanitation Agency |
| HIV/AIDS | Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome |
| GOP | Government of Pakistan |
| BRMP | Balochistan Resource Management Program |
| BWRMA | Balochistan Water Resource Management Authority |
| NFC | National Finance Commission |
| MW | Megawatt |
| ILO | International Labor Organization |
| FBS | Federal Bureau of Statistics |
| NGO'S | Non-Government Organizations |
| PHED | Public Health Engineering Department |
| UN | United Nations |
| PMD | Pakistan Meteorological Department |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| GDP | Gross Domestic Product |
| GNP | Gross National Product |

# List of Tables

# Acknowledgement

All praise and gratitude returns to Allah Almighty, for His blessings throughout my research work. I would like to express my sincere gratitude to my Supervisor Dr. Fazal Rabbi for his continuous support, patience, motivation, enthusiasm, and immense knowledge which helped me in my M.Phil studies and research work. It was a great privilege and honor to work and study under his guidance.

I am extremely grateful to my parents for their love, prayers, caring and sacrifices for educating and preparing me for my future. My deepest gratitude to my wife, verily she left no stone unturned in supporting and encouraging me throughout this arduous task of conducting my MPhil dissertation. I also wants to express my thanks to my sister Aniqa Wali, my brothers Idrees Khan, Anis Khan, Khyber Khan, Maiwand Khan and Mohsin Khan for their support.

Besides my family, I would like to thank my dear friend Mohasnain Ali and his sisters. I am indebted to them, without their help it will be not possible to achieve such honor. Moreover I would like to mention Mr. Syed Fareed Ullah, Mr. Iqbal khan kakar, Mr.Ikram Kakar and Anwer Ali for helping me with the technicalities of this thesis. I am extending my thanks to my friends Mohib-ur-Rehman, Jawad Ahmed Ikhlaq, Khalil-ur-Rehman, Zainullah Kakar, and Raza Jehan Tehbo for believing in me and for their love and support, without them I would not be able to complete my M.Phil Thesis!

Most importantly, I would like to dedicate my dissertation to my Late Brother Ajab Khan Bazai. My deepest gratitude goes to those who indirectly contributed in this research; your kindness means a lot to me. May Allah bless you all.

********

# CHAPTER 1

## Introduction

Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being.[1] World as we have known has gone through series of protracted phenomena ranging from social issues to environmental degradation. Scientific revolution coupled with massive industrialization provided impetus to the development of international society. One must not forget the benefits of modern world but there are several problems that have resulted due to massive scientific advancements.

Science equipped human beings to exploit the natural resources of the world for the well-being of society but at the same time disturbing the ecosystem and the natural habitat of life. Many development studies predict that this sudden change in the environment is deteriorating the natural way of living. Therefore they recommend that there is a dire need of sustainable human and economic development along with preservation of nature.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given; and
- The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs[2]

As discussed above sustainable development called for maintenance of ecology and environment. Efforts are needed to be done otherwise human beings make confront several issues.

[1] William M. Lafferty, and Katarina Eckerberg, *From the Earth Summit to Local Agenda 21: Working Towards Sustainable Development (*Washington: Earthscan, 1998),17.
[2] United Nation Development Program (2015), "The SDGs In Action," *United Nation Development Program*, Octobar 25, 2015. https://www.undp.org/sustainable-development-goals.

One of them is deforestation; it may have a compound effect on many other ecological problems. Greenhouse gasses emission may further increase the problem of global warming. It said that the number of trees worldwide has fallen 46 percent since the dawn of agriculture 12,000 years ago and more than 15 billion trees are felled every year. That loss has significant implications for the planet in terms of climate change, biodiversity, and human well-being.[3] Other problems include the decrease of oxygen in the air which is one of the basic needs for the survival on human beings. Furthermore deforestation results in decreased precipitation causing insecurity of water which is also a basic need. Apart from deforestation there are several other factors that result in the imbalance in environment thereby creating a problem for natural habitat. For instance, the phenomenon of massive industrialization results in the exponential growth in air and water pollution.

However, these problems seem enormous, sustainable development proposes several ways to counter these issues, ranging from environmental to political. One must not neglect the economic and political factors while relating to these issues. Economics plays a pivotal role in shaping of the society at social as well as environmental level. Moreover, economic stratification also determines the factors contributing to the exploitation of natural sources. For instance a superficial look may revealed that environmental collapse is caused by some of the great actors of the world but its effects transcends to all the communities of the world. Those who have the ability to counter these problems remain indifferent of the environmental issues while others have to face those issues head on.

Take the example of Pakistan. Pakistan is facing problems which are causing issues for the natural living of its population. By the time these problems reach the poor and down trodden there effect is increased largely. The poor are unable to counter those problems. Balochistan being the most destitute of all the other provinces of Pakistan, experience this kind of dominos effect. Those people of Balochistan who are powerful enough can get their hands on multiple sources thereby remaining aloof of these problems. A person who barely makes ends meet have to survive on poor nutrition, with pathetic facilities coupled with diseases and epidemics.

[3] Rhett Ayers Butler, "How many trees are cut down every year?," *Mongabay*, September 2, 2015. https://news.mongabay.com/2015/09/how-many-trees-are-cut-down-every-year

Balochistan's irrigation system was based on precipitation. Massive urbanization combined with weak governance resulted in deforestation, which prevailed in the form of decreased precipitation annually one of the major issue that this provenance is experiencing is water insecurity especially in urban centers. Quetta being the capital city of Balochistan is going through severe water crises. People have to understand that this may reach an alarming state, where only a few elites can enjoys the privilege of drinking clean water. According to data compiled by the Pakistan Meteorological Department (PMD), overall rainfall between July 1 and Aug 27, 2018, was 28pc below normal. Rainfall was 47pc lower than the average rainfall in August, which an official attributed to the impact of climate change on the country's temperature pattern. Balochistan saw a 54pc reduction in rainfall; its average in July and August is 51.1mm but it received 23.5mm.[4]

Some of the studies have clearly shown that the suburbs of the Quetta city are experience severe water insecurity, due to which agriculture is falling apart.[5] If this situation remains the world may see another catastrophe like that of Karachi. Serious steps must be taken on emergency bases, but with the clear pretext of achieving sustainable development goals. Public private collaboration may prove quite pertinent in devising a plan there by solving the problem of water insecurity.

However, integration of environment and development concerns and greater attention to them will lead to the fulfillment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. No nation can achieve this on its own; but together we can - in a global partnership for sustainable development.

## Statement of the problem

Water insecurity has proved quite detrimental for many regions of the world. Recent developments and various reports have shown alarming facts regarding the water insecurity in the region of Balochistan especially the urban centers of the province. Reports suggest that the city of Quetta is going to run out of water in the near future. Therefore, there is a need to explore the causes and impacts of water insecurity in the city of Quetta from socio-economic perspective.

[4] Ali Khan, "Pakistan Received 47pc Less Rainfall Than Usual This August," *Dawn*, August 28, 2018.
[5] Zainuddin Kakar, Syed Munawar Shah and Maqsood Ahmad Khan,"IOP Conference Series: Materials Science and Engineering,"*IOP Scienc*, April 2, 2020 https://iopscience.iop.org/article/10.1088/1757-899X/414/1/012013/pdf

## Significance of the study

This study may propose emerging contours in the field of sustainable development with relation to socio-economic factors. This relation may be quite helpful in solving the arduous task of water insecurity thereby, helping those community and areas which are facing the problem of water shortage.

## Objective of the study

The study focuses on the following objectives.

1. To examine the assurance of water security in sustainable development.
2. To explore socio-economic factors resulting in the insecurity of water in Quetta.
3. To identify the gaps showing the inter-relationship between sustainable development and water insecurity.
4. To determine the effects of water insecurity in Quetta.

## Research Questions

1. How sustainable development ensures water security?
2. How water insecurity affects human development in Balochistan?
3. How does Quetta fall in the pit of water insecurity?
4. What are the outcomes of water insecurity in Quetta?

## Theoretical Framework

The main focus of the study is normative but some discursive perspectives are also applied. Basically theory is applied to understand some kind of practical phenomena. The main theory which is used in this study is Malthusian theory by Thomas Robert Malthus; this theory is applied

To understand the impact of Population and urbanization on food resources and would help to understand inter-relationship between sustainable development and water insecurity.

## Literature Review

Water security has been a pertinent issue for 5 decades. Many people have done work on water issues and collect many data based on statistic and facts in this manner showing the problem of water insecurity.

According to the report of UNESCO water uncertainty can be worsened by drought. People mostly affected water deficiency than the other disaster. Report show that 411 million people affected by disaster in 2016. Out of them 94% were effected by draughts. Draughts are also the highest disaster, wreaking havoc on agriculture in particular; droughts cost the US agriculture industry an average of US 68 billion dollar per year. Draughts in china per year has resulted an annual grain production loss of more than 27 million tons over the last two decades, and the annual average crops area affected by droughts increased 116% since 1950's to the beginning of this century from 11.6 million hectares to 25.1 million hectares.[6]

In their research article published in EconPapers also stated that the new data collected from WRI's aqueduct tool show that those 17 countries-home to one –quarter of the world's population-faces tremendously high level of zero line water stress. Every year more than 80% of their available withdraw by irrigated agriculture, industries and municipalities. Forty four countries, home to one third of the world's population are under high stress with annual withdraw of more than 40 % of available supply.[7] There is such a small difference between supply and demand; countries are sensitive to change like droughts or higher water withdrawals. Which is why more and more communities are experiencing "day zero "and other disaster.

According to Hofste and Reig that one quarter of mankind faces a coming water crises ,including the possibility of running out of water ,which may seem unthinkable given that water covers 70% of the earth surface. Despite this up to 80% of available surface and ground water is consumed each year, and worldwide water consumption is expected to rise 55% by 2050.[8] What is causing the world's water insecurity dilemma and what is driving the rising demand for water.

---

[6] UNESCO, United Nations World Water Development Report, 2014 (New York, NY: UN Headquarters, 2013), 22.
[7] Tatiana Kostova and Kendall Roth, "An overview of Hofstede-inspired country-level culture research in international business," *EconPapers 48*, no.2 (2017). http://link.springer.com/10.1057/s41267-016-0038-8
[8] Willem Hofste, Paul Reig and Leah Schleifer, "17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress," *world resource institution 1,* no.2 (AUGUST 6, 2019), https://www.wri.org/insights/17-countries-home-one-quarter-worlds-population-face-extremely-high-water-stress.

President of the world water LoïcFauchon, says to Gitika Bhardwaj about the cause of water scarcity around the world and most effective ways to develop long term remedies.

"One third population of the world does not have easily access to the safe drinking water and also over 4 million people absence of possible sanitation. How can waste water be used more effectively and do you believe that global objective of providing everyone with safe and clean drinking water is still achievable?"[9]

The UN statistic listed below conform the facts. More than 2 billion people live in country with severe water scarcity.[10] By 2040 one in every four children under the age of 18- a total of 6 million will be living in area with extremely severe water stress.[11]By 2030,700 million people could be displaced globally due to severe water scarcity. Approximately 4 billion people, or about roughly two-third of the world's roughly population face acute sever water scarcity for at least one month each year.[12]Water insecurity in some arid and semi-arid areas may displace between 24 million and 700 million people by 2030 according to the current climate change scenario.[13]

Already, one third of world's largest ground water system is in trouble (Richey et al., 2015). Nearly half the world's population presently living at least bone month per year in potentiality water scarcity areas, this figure could be rise to 4, 8-5, 7 billion in 2005. Asia is home about 73% of those effected people. (69% by 2050).[14]

Despite the fact, some people have gone so further r analyze the link between water insecurity and social issue .whatever is the relationship inversely\conversely proportionally or directly proportional? Some people believe that t water scarcity is to not withstanding these facts there are some people who went further to discuss the relationship between water insecurity and social problems. Whether the relationship is directly proportional or inversely/conversely

[9] Kendall Roth, "World Water Development day," *EconPapers* 6, no.2 (2013). http://link.springer.com/10.1057/s41267-016-0038-8
[10] United Nation, water scarcity and World Water Development, 2015 (New York, NY: UN Headquarters, 2013), 12.
[11] United Nation, "Knowledge leadership in child and adolescent rights," *UNICEF publications 6,* no.3 (2020)
[12] Mesfin M. Mekonnen And Arjen Y. Hoekstra, " Four billion people facing severe water scarcity," *Science Advances 2*, no.2 (February 2016):15.
[13] UNESCO, United Nations World Water Development Report, 2014 (New York, NY: UN Headquarters, 2013), 22.
[14] Burek et al, Final Report on Water Futures and Solution - Fast Track Initiative, 2006.

proportional? Some believe that the concept of water insecurity is multifaceted topic. It's about social, economic and political ramifications among the other things.

Natural catastrophe risk management, such as flooding, tsunamis and earth quakes, require a six billion-dollar annual expenditure according to the UNDP. With the approval of sustainable development goals (SDGs) around the world new targets have emerged, such as guaranteeing that developing countries receive an annual allocation of USD one billion until 2020 to help them mitigate the effects of climate change.[15]

Pakistan has water shortage problem. It is not just international idea; many intellectual scholars have attempted to address the issue. In 2006 Dr. Ahmed Asad examined the subject of Pakistan's transaction from a water-stress to water-scare country. Pakistan is experiencing an unprecedented water defect as a result of climate change and inadequate water management, which has resulted in water being exploited at faster rate than it is replenished, contributing directly to the expending water insecurity issue. In Pakistan Balochistan province is the country's most water-scare region. Water is regarded everything in Balochistan since it is a scare resources that increase the value of land from nearly  nothing to high priced commodity in locations where adequate ground water or surface water are accessible.[16]

According to the reports, World Bank has established link between water issue and Socio economic factors. According to the new report of World Bank, Pakistan can reap grater economic, social and environmental advantages from its water if urgent reforms are implement to increase water use of efficiency and service delivery

According to the report of World Bank Pakistan: Getting More from Water .[17] Pakistan is world's sixth most populous country, is well endowed with water; water availability per person is low. In comparison to the other countries water wastage is high and agriculture output is low.

Pakistan's water scarcity has reaches a critical point, it's require immediate attention and reforms, according to Illango Patchamuthua world bank country director for Pakistan. "It is vital

[15] United Nations Development Programme, "Transitioning from the MDGs to the SDGs," *United Nations Development Programme*, November 9, 2016, https://www.undp.org/publications/transitioning-mdgs-sdgs?
[16] Asad Sarwar Qureshi, "Water Management in the Indus Basin in Pakistan: Challenges and Opportunities,"*BioOne*, 1 August 2011.
[17] World Bank, "Pakistan : Getting More from Water," Water Security Diagnostics Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/251191548275645649/Pakistan-Getting-More-from-Water

to increase irrigation production while also paying attention to the social and environmental elements of water management. Strong collaboration between the federal and provincial government, as well as other stakeholders will be required. To establish resilience in the face of changing climate and rising water needs, the goal must to be strengthening water governance and strategic water planning."[18]

Many of Pakistan's water related challenges according to the word bank are due to poor governance. "Over reaching policies, strategies, budget and incentive structure that are effect or impact water resources; the applicable legal and regulatory frameworks, institutions, planning, and monitoring procedure" all are part of governance. The focus is on legislative frameworks, policies, and institutional structure in this part; sector financing will be discussed latter. Water security is underpinned by effective water governance, which determine "who receives what" and "who does what'' in term of water resources and services, as well as the mitigation of water related hazards, in sustainable, equitable, and transparent manner. Effective water governance in Pakistan must be suited to the country's particular biophysical and geo political contexts, as well as reflect the country's cultural and political traditions.

Further more informal governance and political economy have considerable impact on the water sector. The evolution of irrigation governance and Karachi's urban water sector are addressed in terms of Pakistan's political economics of water. Pakistan faces major irrigation and urban water governance concerns. Further reforms progress would include tough political economics issues based on understanding where and why previous reform efforts failed.

In this way, Balochistan is the most effected province. In this research, Zainuddin Kakar provides numerous examples in this regard. He stated that the water supply in Balochistan Quetta is regulated tube well; the ground water sources is exhausted and severe water shortage are common. The sanitation system is outdated and in need have repair. There are about 100 kilometers sewers covering a small portion of city and there is only one broken wastewater treatment plant. The majority of Quetta's waste water and urban runoff is dumped into open sewers, which are

[18] United Nations, "Helping the UN build a better world," United Nations Foundation, https://unfoundation.org/.

frequently filled with solid trash and prone to overflowing. Untreated wastewater has been found in urban orchards, posing serious health risk.[19]

The current serious water situation has been exacerbated by the severe and prolonged droughts of 1998-2004 and 2013-2015.[20]Permanent sources such askarzes, springs, and tube wells have dried up. Groundwater deletion is caused by widespread rural and urban electrification, agriculture tube well electric tariff subsidies, and the cultivation of high delta crops. This resulted in lower agriculture incomes, increased unemployment, animal losses, decreased land cultivation and worst of all tree drying.

According to the Pakistan institute for Water Development, a discussion with respondents found that water insecurity has significant impact on the residents of Quetta district. The following are some of the effects of water scarcity on inhabitants in Quetta's rural areas. Quetta, the provincial capital of Balochistan, lies 1,680 meter above sea level. Chiltan, Murder, and Zarghon Mountains surround it on all sides.[21] Due to its ever-increasing population and the flood of Afghanistan refuges, Quetta is suffering numerous socio economic issues. Water insecurity has been long problem, and during the low rain fall period the situation become worse.

Agenda 21 addresses today's critical issue of sustainable development while also preparing to face the challenges of next century. It shows a worldwide consensus on the developments and environmental cooperation, as well as political commitment at highest level. Governments are responsible to insuring its successful implementation. In order to do this national plan, strategies and policies are essential. Such type of national efforts should be supported and supplemented by international cooperation. The United Nation system has a critical function to play in this regard. Other international, regional and sub-regional organization is also encouraged to participate. Widest public participation, as well as active participation by non-governmental organization and other groups should be encouraged.[22]

---

[19] Zainuddin Kakar, Syed Munawar Shah and Maqsood Ahmad Khan,"IOP Conference Series: Materials Science and Engineering,"*IOP Scienc,* April 2, 2020 https://iopscience.iop.org/article/10.1088/1757-899X/414/1/012013/pdf

[20] Nasurullah K, M Ahmad, MGK Malghani, E Kakar, "Socio-economic effect of water scarcity in tehsil karezat district Pishin Balochistan,: *Journal of Applied & emerging Science* 2, no. 2 (February 2011): 78.

[21] SM Khair, S Mushtaq, R Culas, M Hafeez, "Groundwater markets under the water scarcity conditions in upland Balochistan, Pakistan," *Agricultural Systems* 107, 1 (2012): 21.

[22] William M. Lafferty, and Katarina Eckerberg, *From the Earth Summit to Local Agenda 21: Working Towards Sustainable Development (*Washington: Earthscan, 1998), 35.

Water is the most important component of health; it has taken significant role of one's life. It is simply impossible to imagine survival without it. The result of the poll shows that not only survival is difficult without water, but it also has impact on the other aspects of existence. This is the one of the main reasons of poverty in the Quetta region.[23]

There are several texts that underscore the importance of water insecurity vis-a vis economics. In this study the primary focus resides on the socio-economic perspectives vis-à-vis sustainable development. The previous studies tried to formulate many ways to counter water insecurity. This study may be helpful in finding out the link between sustainable development goals and the problem of water insecurity.

## Methodology

The research is based on deductive approach. The mix research methodology comprising both qualitative and quantitative methods has been employed to accomplish the undertaken study. The required data has been collected through both the primary and secondary sources of the mix research method. Primary sources includes interviews, government reports, records of organizations while secondary sources are textbooks, encyclopedias, news articles, review articles, and meta analyses.

## Organization of the Study

This dissertation has been divided into five chapters. The first chapter is deals with Introduction. In this chapter, an extensive design on the thesis has been given. This chapter has formed the outline of the thesis including the data consulted while conducting the research. The chapter involves the central research questions. The second chapter is under the heading of Theoretical Framework. It will precisely describe the theory used to explain the course of events. This chapter covers the theoretical background of the research. The third chapter deals with the sustainable development and problems. This chapter is significant because it lays the ground work for the next chapters. The fourth chapter will discuss the impacts of water scarcities on Socio-

[23] Ashraf M and Majeed, A, "Water requirements of major crops of Balochistan*," IUCN Water Programme, Balochistan Programme Office*, (2006): 139.

economic Development of inhabitants of Balochistan. The last final chapter is survey on water insecurity and its implication on the city of Quetta.

# CHAPTER 2

# THEORETICAL FRAMEWORK

## Introduction

There are plenty of approaches that can be used to understand the phenomenon of water insecurity with regards to sustainable development. In this research, primarily, Malthusian theory is used to understand this anomaly. On secondary bases couples of other theories are also used naming, Neo Malthusianism and Supply Induced Scarcity theory. However the main focus of the study revolves around Malthusian theory.

## Malthusian Theory

Malthusian theory proposes the idea that population growth is inversely proportional to subsistence.[24] It means that as population starts to grow, the resources will start to deplete thereby, decrease in the resources. A devout Christian, Thomas Robert Malthus was the one who proposed the idea of Malthusian theory. Some analyst believe that this theory has only economic dimension, where as deep look in the theory will highlight will many new dimensions, ranging from social to political. Thomas Robert Malthus laid it out in his 1798 writings, an essay on the principles of population.[25]

## General Assumptions

- Food and water are necessary for human existence. Human population grows much faster comparable to the resources present in the world.
- Human population grows exponentially that is geometric progration.1, 2, 4, 16, 64.....

[24] Thomas Robert Malthus, *An Essay on the principle of population* (London: J. Johnson, 1798), 34.
[25] James Bonar, *Malthus and his works* (London: Rutledge, 1966), 67.

- On the other hand the rate in which resources are produced is linear that is arithmetic progression. 1,2,3,4,5...
- For the maintenance of an optimum equilibrium between the population and resources, humans have to take up some repressive methods. These methods are called preventive checks and positive checks.
- If population keeps on growing without these checks, it would eventually leads to Malthusian catastrophe, thereby, disturbing the equilibrium between the availability of subsistence and population growth

Thomas Robert Malthus proposed that by geometric increase in population means that the population will grow double in twenty five years. On the other hand the growth in subsistence will be arithmetic. These will eventually create different ratios, whereby, population pressing against the means of subsistence. The proposed solution by Malthus revolved around two major concepts

- Malthusian catastrophe also known as Malthusian nightmare, Malthusian crises, Malthusian disaster or Malthusian pessimism.[26]
- Checks i.e. Preventive checks and Positive checks.

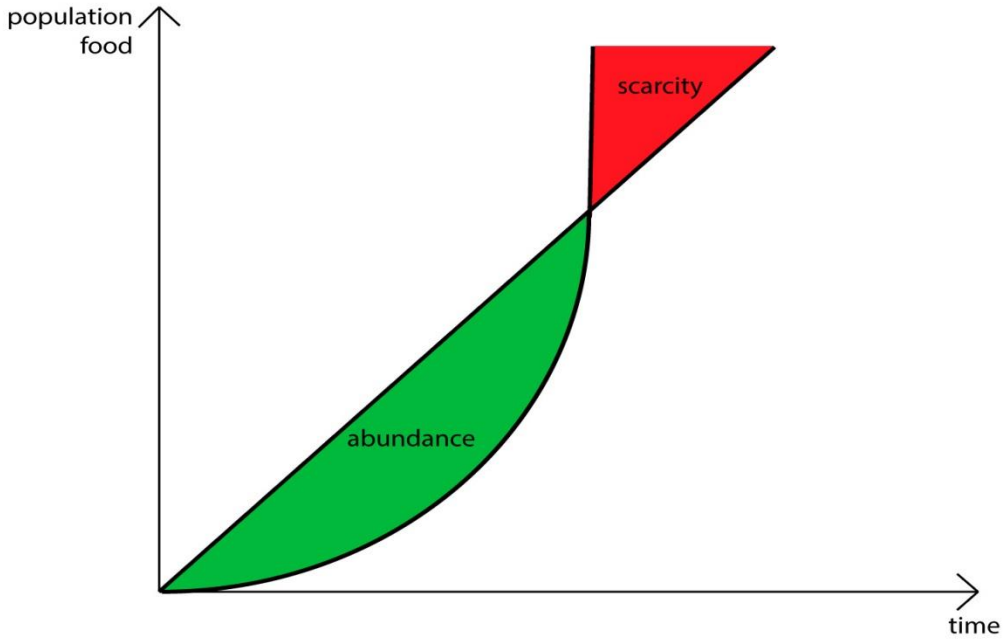
Malthus believed that Malthusian catastrophe will create a negative reinforcement for the population. Once realized that a Malthusian catastrophe is reached, the population will be forced to return to subsistence levels conditions. He believed that the disturbance in population to subsistence equilibrium will create a kind of an existential crisis, which, in turn will compel the masses to revert to the mean position.[27] By mean position it is meant that the equilibrium should be set to default position.

The above discussed equilibrium can only be maintained with some regressive actions. For this purpose some kinds of checks must be incorporated. Preventive checks referred to the regressive measures based on the moral restraints. This may be done through legislation. It may include abstinence. Moreover by legislation some people may be deemed unfit or deficient by the

[26] Natasha Kwatiah, "Top three theories of population," *economic discussion* 2, no.3 (September 2011):33.
[27] Devlaeminck, Adeel, Sandford, "water scarcity in a new world," *The human face of water scarcity* 1, no.1 (January, 2017):47.

government. On the other hand positive checks are ways by which population is reduced by natural processes such as famine, disease, wars, infertility etc.

*Thomas Maltus Chart 1*




Source: https://policonomics.com/malthusian-population-theory/

Furthermore, Malthus also presented the idea of population vis-à-vis evolutionary and historical perspectives. It is a well-known fact that Malthus was inspired by the ideas of Charles Darwin.[28] Therefore, he presented the idea of the Demographic Transition model which was evolutionary in nature.

## Demographic Transition Model

Demographic Transition model suggests that a mass of population or a country would go through some evolutionary stages to eventually reach its pinnacle. By doing so an equilibrium will be reached. He divided his approach into 4 evolutionary processes or the stages.

- **High Stationary or Pre-Industrial**

[28] Micheal Shermer, "Why Malthus is still wrong," *Scientific American* (5,2016): 12-17, https://www.scientificamerican.com/article/why-malthus-is-still-wrong/#:~:text=The%20problem%20with%20Malthusians%2C%20Bailey,Borlaug%20and%20the%20green%20revolution.

- **Early Expanding or Early Industrial**
- **Late Expanding or Late Industrial**
- **Low Stationary or Low Fluctuating**[29]

**Stage 1**

**High Stationary or Pre-Industrial**

**High Birth Rates.**

1. Family planning is quite low

2. Due to less survival parents tend to reproduce many children.

3. Religious beliefs and cultural traditions compelled people to reproduce into large numbers.

**High Death Rates.**

1. Diseases and plagues were quite fatal due to poor medical facilities.

2. Poor diet and malnutrition coupled with famine.

3. Unhygienic and unclean water further deteriorated the conditions.

This stage is constant in nature. Unprecedented rise in the birth rates and death rates result in the constant or slow growth in the population-time graph.

**Stage 2**

**Early Expanding or Early Industrial**

In this stage, the birth rate remains high, due to the same reasons discussed in the stage 1, whereas the death rates have fallen due to several reasons.

1. Improved medical facilities.

2. Innovations in the medical fields such as the inventions in the field vaccinations and the inventions of new drugs.

[29] Tim Dyson, *Population and Development* (London: Zed Books, 2010), 79.

3. Improved sanitation and water supplies.

4. Due to availability of doctors and hygienic medical facilities, there is an increase in child fertility rate.

Malthus coined the term for this stage. He called this stage as the era of Population Explosion. Due to increase in population and decrease in death rates there is a steep gradient in the population-time graph.

**Stage 3**

**Late Expanding or Late Industrial**

This stage is quite eccentric in itself as it incorporates many fields of social sciences at one time. E.g. Political Science and Economics. Due to modernity and scientific revolution humanity has gone through many social changes, thereby creating a new stage with regards to population growth.

**Falling Birth Rates**

1. Family Planning through contraceptives and other methods.

2. Modernity weakened the institution of religion, thereby there was a decrease in marriages coupled with decrease in child mortality.

3. Industrialization and scientific inventions resulted in less reliance upon the labour. Therefore, there was no need for large numbers of labour.

4. Large families were replaced with large material possessions and the desire to live longer and happier. Therefore, the desire of many children is replaced by desire of having multiple possessions.

**Low Death Rates**

Death rates remain low due to the conditions mentioned in stage 2. This is turn changes the dynamics of population to subsistence 16ehavior16um. Population is still growing but at a slower pace.

**Stage 4**

**Low Stationary or Low Fluctuating**

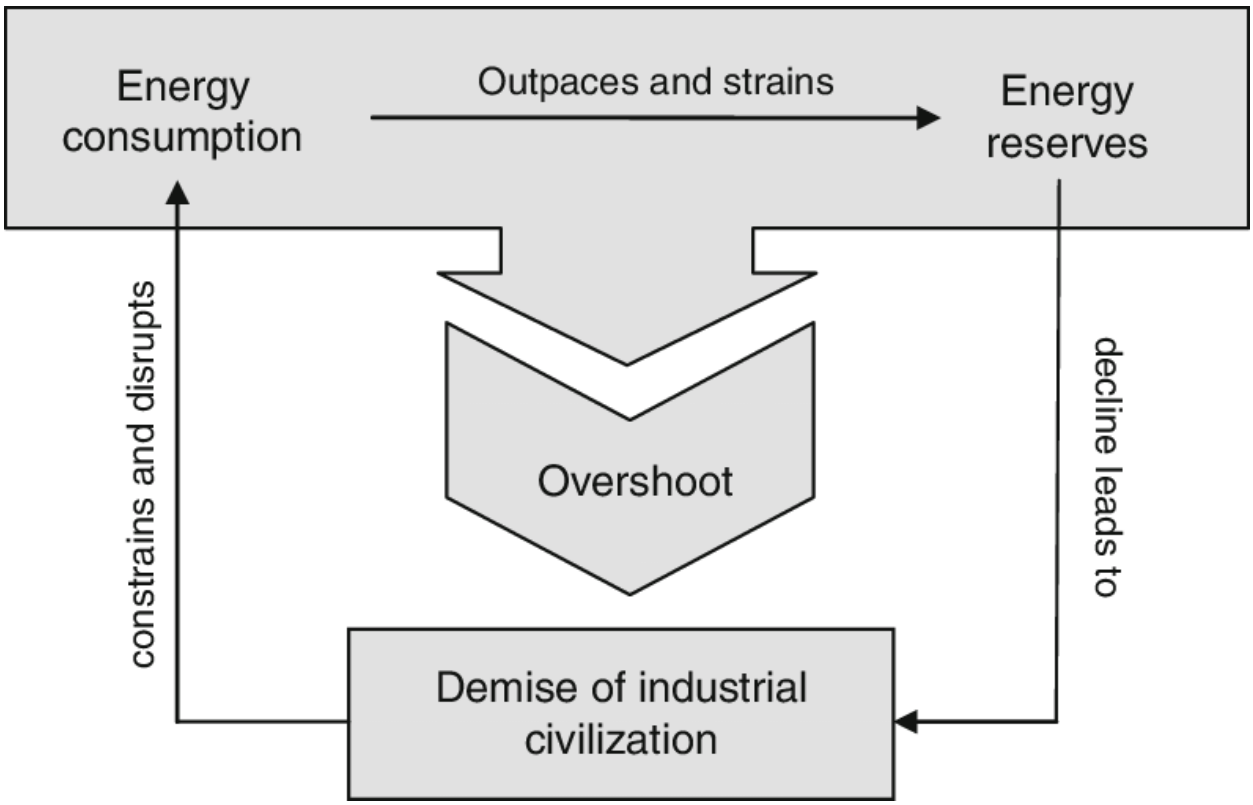
**Birth Rates**

Birth rates remain low due to emancipation of women. Feminism coupled with Socialism is the major reason behind it. Contraception of families increased manifolds.

**Death rates**

Evolution in the field of medical technology due to huge funds being allocation to medical science. At this point in time a stable and optimum equilibrium is reached between population and subsistence due to low born rates and death rates, an aging society emerges thereby going beyond the Malthusian catastrophe.

*Demographic Transition Model 1*




Source: https://populationeducation.org/what-demographic-transition-model/

## Neo Malthusianism

Neo Malthusianism transcends itself to a deeper level. Instead of focusing on human population, Neo Malthusianism digs deeper to focus on other species as well. It revolves around the advocacy of planning vis-à-vis human population. Therefore, its main focus revolves around birth control through contraceptive methods.[30] Malthusianism revolves around abstinences (self-control) and austerity. Thomas Robert Malthus was a devout Christian who believed that contraceptive methods would ultimately lead to the decay of the society. Due to varying power dynamics and social change, Neo-Malthusianism finds its way through the mainstream population. Neo-Malthusianism demands for strict repressive measures i.e. preventive checks.

Neo-Malthusianism demands for greater involvement of legislative laws, when it comes to population-subsistence graph. In order to ensure population balance with the availability of resources, no stone must be left unturned. The focus of Neo-Malthusianism shifts towards institutions, governments, NGOs and organizations. It concludes that the major responsibility lies upon these institutions.[31] Strict rules and laws must be imposed, making it compulsory for the masses to act in the favour of the population-subsistence equilibrium.

Moreover, Neo-Malthusianism concerns itself with the political and environmental factors also. Neo-Malthusianism revolves around 4 evolutionary concepts.

## Overconsumption

Neo-Malthusianism revolves around the notion that overconsumption is only a part of the problem. The poor management of the natural resources coupled with overconsumption is deteriorating the problem. In its core Neo-Malthusianism ideology seems a bit like Marxist ideology. It is the core responsibility of the masses to consume the resources at a subsistence level. Food and water must be used as a need rather than a luxury. This kind of austerity is needed for the betterment of society.

[30] Penn Handwerker, *Culture and Reproduction* (London: Routledge, 1986)
[31] Ibid, 58.

## Resource Depletion

Scientific inventions and modernity have its plus but on the other hand modernity has its costs on the nature. Depletion of the natural resources for the attainment of the luxurious life by a few results in the bigger problem for the masses. This creates a crunch in the natural habitat of the environment. The effects of this crunch are inversely proportional to the well-being of the masses. The peasantry or the poor cannot afford to buy clean drinking water.

## Environmental Degradation

Resource depletion will ultimately leads to environmental degradation. Environmental degradation is a condition where environment takes its toll from the population. The harmony between masses and the environment is disturbed; therefore it results in famine, floods and earthquakes.

## Ecological Collapse

The island of Maldives is a good example of ecological collapse. The whole tree of ecology is disturbed due to the problems discussed above. These problems start with overpopulation. Overpopulation in turns gives birth to over consumption. Overconsumption is a compelling force which leads to resource depletion and environmental degradation, thereby collapsing the ecology.

## Supply Induced Scarcity Model

Another model that complements the Malthusian theory is the Supply-Induced Scarcity model. This model suggests that environmental degradation and depletion of the natural resources will lead to drastic social outcomes such as war, disease; famine migration etc. The concept of supply-induced scarcity is political as well as psychological in the nature.[32] It refers to the normative concept that human and non-human resources are always finite. Therefore, it is a kind of an existential crisis, thereby; goods are always low in amount comparable to increasing population. For example goods are relatively scarce. Scarcity also refers to an individual's lack of resources to buy commodities. If one needs to understand the concept of scarcity a psychological

[32] TA Benjaminsen (2008), "Does Supply Induced Scarcity drive violent conflicts in Africa," *Journal of Peace Research* 4, no.7 (2008): 23-26

perspective may be helpful. Scarce objects are placed on a higher value, where abundant objects are places on a lower value. Due to depletion of resources and environmental degradation, water and food resources are placed on a higher value. The burden of this scourge is mainly on the poor.[33] Therefore it is actually the lower class that suffered the most, and are most susceptible to the famine and the disease. This phenomenon is more like that of a Malthusian catastrophe.

## Absolute and Relative Scarcity

"Absolute scarcity refers to the scarcity of resources on general, the scarcity of ultimate means. Absolute scarcity increases as growth in population and per-capital consumption push us ever closer to the carrying capacity of the biosphere. The concept presupposes that all economical substitutions among resources will be made. While such substitutions will certainly mitigate the burden of absolute scarcity, they will not eliminate it nor prevent its eventual increase".[34] The concept of relative scarcity is more of an optimistic approach toward goods. Scarcity creates competition. The needs of the human cannot be fully satisfied; therefore scarcity is inevitable for the growth of the masses. It is arguable that scarcity refers to the concept where there is a large gap between limited resources and unending wants. Modern sociologists argue that people have to go for a less lavish lifestyle. It is not the population, rather the major problem is the limitless wants of the people that is the main cause behind the scarcity of resources.

"When time and the means for achieving ends are limited and capable of alternative application, and the ends are capable of being distinguished in order of importance, the 20ehavior necessary assumes the form of choice. Every act which involves time and scarce means for the achievement of one end involves the relinquishment of their use for the achievement of another. It has an economic aspect"

## Demand Induced Scarcity

The rate of growth of population is directly proportional to the consumption levels. This will have inverse effect on the availability of the natural resources to each individual. The case study of sub Saharan Africa is quite pertinent. The population of Rwanda increased from 177

[33] B Kennedy, "Environmental Scarcity and the outbreak of conflict, *"Population Reference Bureau* (2001): 31-32, https://www.prb.org/resources/environmental-scarcity-and-the-outbreak-of-conflict/
[34] Devlaeminck et al, *water scarcity*. 66

million to 657 million in the year 2000.[35] The effect of this increase was two folds. One, it shrinked the amount of land present and secondly the availability of fresh water per person decreased exponentially. These demographic pressures played a pertinent role in the genocide of 1994.

## Supply Induced Scarcity

Depletion of natural resources and environmental degradation has a fatal impact on the availability of resources to each individual. Modernization coupled with industrialization has deteriorated the balanced equilibrium. Ecosystem is disturbed. Many species are failing to survive to radical changes in the environment. One must not forget the impact of global warning on the vegetation and human population.

## Structural Scarcity

One of the main reasons behind the non-availability of the natural resources is the unequal access to the natural resources. It is quite eccentric that there are only a few who enjoy the privileges whereas the large segment of the population remains on the borderline. Due to this unequal access to natural resources large chunk of the society experiences scarcity. In South Africa under the apartheid system, 87% of the land was controlled by whites, while the little rest is given to the black population. Moreover there was an inequitable distribution of resources in that 13% land, where local elites enjoyed most of the privileges and controlled large areas of land.[36]

## Resource Capture

The relative scarcity of a resource, due to any reason, makes it often more valuable. This increase in the value, causes a ripple in the elite and powerful groups. Those who have the ability to control the resources, tend to obtain that resource for themselves. This in turn results in making the resource scarcer. In this way, the demand induced scarcity is coupled with an increase in structural scarcity. This two-fold scarcity creates a snail paced increase in natural resources, whereas the population on rise will still be exponential.

[35] Malthus, *Essay on population*. 38

[36] T Homer Dixon, "Environmental Scarcity and violent conflict," *Journal of Peace Research* 7, no.6 (1998): 11-12

## Ecological Marginalization

The decrease in the vital resources has a very radical effect on the lives of the masses. The decrease might be due to supply-induced scarcity, demand-induced scarcity or structural scarcity. This results in impoverished people often move into ecologically-sensitive areas such as hillsides, tropical rain forests, and areas at risk of desertification. The rising population in these areas, combined with unsustainable land use practices, leads to environmental degradation and further scarcity.

It has been argued vividly under the umbrella of supply-induced scarcity model that environmental pressures can seriously maneuver the securitization and socialization of a nation. Moreover, recent debates also revolve around the concept of environmental insecurity.[37] The concept of environmental security encompasses many straits of sub-issues ranging from food insecurity to water insecurity. But one has to define the concept of security-insecurity vis-à-vis water.

## Water Insecurity

Water insecurity refers to a threat posed by water scarcity to individuals and nations. Its focus may transcend the boarders and have an international effect on the problem of insecurity.

Copenhagen school defines water insecurity as the conflict created due to non-availability of clean water.[38]

Water insecurity is defined as the relationship between international security and its proportionality with the decreasing quantity of water.[39]

Water insecurity defines as a conflict in the least developed countries vis-à-vis water scarcity[40]

The concept of water insecurity encompasses physical, social and economic well-being of a nation vis-à-vis water scarcity.[41]

[37] Ibid.
[38] Saeed Eslamiah and Faeiza Eslamiah, *Handbook of Drought and water scarcity* (London: Rutledge, 2017)
[39] Devlaeminck et al, *water scarcity*, 66.
[40] Dixon, *Environmental Scarcity*, 107-112.
[41] Eslamiah, 73.

Contemporary research is quite relevant with the concept of water insecurity. These researches indicate that due to scarcity in environment resources, the tendency to violent 23ehavior increases manifolds. The problem of water insecurity may not manifest in the form of war among countries, rather it will lead to conflicts and chaos within a country. It can create severe civil and social unrest. These conflicts can be sub-national insurgencies and ethnic in nature. One can presume that water security can increase the diameter of fault lines, thereby giving birth to indigenous conflicts. Although this kind of violence may affect the developed societies but the main toll is on the less-developed societies. This is due to the fact that less developed societies are heavily dependent upon natural resources. Therefore one can conclude that less developed areas are more prone to conflicts with regards to water insecurity. There is a stark tendency of this because of marginal economic well-being coupled with fragile political institutions. The dilemma of water insecurity can possibly produce 5 types of conflict.

1. Conflict resulting due to environmental degradation at indigenous level for example water logging, emissions from industries etc

2. Water insecurity may increase social cleavages thereby resulting in ethnic clashes, migration and sub national conflicts.

3. Scarcity-Induced wars, the primary scarcity is that of water. Whenever local resources deplete, the states tend to attain resources deplete, the states tend to attain resources through trade or war. The latter being the more likely one.

4. The east west conflict. The developed countries enjoy a vantage point, where they can exploit the natural resources for their own good. On the other hand the less developed countries have to bear the burden of scarcity especially when it comes to natural resources.

5. Scarcity creates disorder in the society the lack of resources will lead to the social issues such as banditry, insurgency and migration etc.[42]

Many argue that environment scarcity is not that bad it can be used as a stimulus to bring about social change. It can create innovation in the field of technology and finance. The necessity of a resource can create novel ideas within the societies to cater the needs of the society. But the opinion

[42] FR Rijsbermen, "Water Scarcity: Fact or Fiction," *Environmental Science & Policy* 114, no.17 (December 2020): 73-85.

of other school of thought is quite pertinent. The less-developed countries are faced with complex kind of environmental scarcities. These problems are so huge that it can hinder the very growth of the society. Rather than bringing about positive change and innovation, it can create dissent and discouragement, thereby collapsing the social fabric of the society. Consequently, water scarcity some time helps to drive societies into a self-reinforcing spiral of violence, institutional dysfunction, and social fragmentation. The negative effects of severe environmental scarcity will often outweigh the positive.

The developed countries generally follow the policy of ignorance when it comes to the phenomenon of water insecurity. But in the long term this will also affect the developed countries as it is quite prevalent that the stabilization in the less developed countries will cause problems for developed areas, because developed areas relives upon developing countries when it comes to human resources and raw materials. In South Africa there has been a mass migration from former black homelands to major cities. There is a swarm of people residing near the urban hubs of the South Africa. Analysts conclude that the major prominence behind this migration is water and fuel wood scarcities. This migration creates scarcity in the urban Centre thereby procuring ethnic conflicts and insurgencies this strife jeopardizes the prospects of foreign investments in the South Africa thereby disturbing the way towards democratic stability and free market trade.

In Pakistan there have been mass migrations towards urban centres like Karachi and Hyderabad due to non-availability of good land and water in the rural areas, people are compelled to move towards cities it creates a web of social problems. Due to high fertility rate there has been an increase of 4 to 5 % of the population.[43] Therefore there has been an increase in the ethnic feuds, violent crimes and insurgencies. This turmoil exacts a great toll on the national economy.

It is quite pertinent that Pakistan is one of the countries which is facing Malthusian trap. In 2019 State Bank of Pakistan published its third quarterly report. In this report there were radical warnings regarding water and food storage due to climate change. Moreover the report stated that unchecked population was growing at an alarming rate.[44] These varying conditions in climate exert a drastic pressure on the agriculture of Pakistan. This in turn may result in Pakistan become one

[43] Eslamiah, "Handbook of Drought,"89.
[44] Maheen Hassan, "Water Security in Pakistan: Issue and challenges," *UNDP Pakistan* (2016): 17-21.

of the first countries to experience or become a proof of Malthusian pessimism. Once these essential resources outstrip the supply, it may lead to environmental catastrophes. Pakistan has to understand the existential crises it is facing. A country experiencing political turmoil coupled with the menace of terrorism cannot afford something like Malthusianism Pessimism.

Pakistan can draw some inspiration from Bangladesh. Bangladesh was also considered as a country experiencing Malthusianism trap. Its population density was 900 people per square kilometer. It was overwhelmed with the problems such as water insecurity and depletion of food and natural resources, but good governance played its part. Deliberate efforts were made through innovative policies, public, private partnership. Also sustainable development goals were kept in mind and huge investments were made in human development and family planning programs. Moreover Bangladesh was way more fragile than Pakistan with regards to climate change. Bangladesh was present at the fault-line and experience huge vulnerability vis-à-vis climate change. Pakistan has adopt this model of development. Sustainable development can be achived through two methods.

- Checks as proposed by Thomas Robert Malthus.
- Through innovation in science and its application for the production of food and water.

Legislation can play very important role in this regard. One has to keep in mind the idea of Neo-Malthusianism. Laws should be amended keeping in mind the sustainable development goals. The management of resources is needed vividly. Family planning programs should be proposed at structural level. Moreover the supply induced scarcity model comes in handy. Mass migration should be hindered. People should be provided with primary need at their motherland. Mass migration can exerts a burden on the economy and resources, thereby, disrupting the equilibrium of population to subsistence. New methodologies in the science should be used to create new forms of natural resources. UAE has generated a water purification plant, through which sea-water is purified and then converted into pure drinking water.

If these measures are not taken, Pakistan may experience water insecurity which in turns lead to violence and chaos. Especially in the area of Balochistan. One has to understand that this part of the Pakistan is underprivileged, terrorized, radicalized and marginalized. People are in so much pain. Moreover the orthodox system of obtaining the water is no longer feasible. If the

availability of resources is not made, worst wind of social crises would be seen in Balochistan. Water insecurity as discussed previously will exert pressure on the rural population to migrate towards urban centers. Once urban centers are filled with multi ethnicities, crime, treachery and ethnic violence will rise. Moreover, the case of Balochistan is even worse, as it experience insurgencies at structural as well as cellular level. Furthermore, the urban center like Quetta has to bear the pressure of increasing population. Water resources were already low in Quetta due to increasing population and development in infrastructure. If this graph keeps on increasing Quetta might fall into Malthusian trap, thereby, experience all kind of social and economic crises.

********

# CHAPTER 3

# SUSTAINABLE DEVELOPMENT GOALS: WATER INSECURITY AND HUMAN DEVELOPMENT

## Introduction

The world as we have seen with its technology and prosperity, has to pay a huge price. Development on one hand is inevitable whereas on the other hand unfettered exploitation of natural resources also creates major problems. Nowadays the phenomenon of sustainable development has become quite popular in the think tanks. Despite the fact that it became a catchphrase in contemporary discourse still the concept remained unclear and vague.

The rhetorical studies are not enough to give solutions to the problems that are faced by the masses. The attempts must be made to move beyond these rhetorical studies and formulate the studies based on practical solutions. Academics as well as practitioners are of the opinion that development literature must be promoted in such a way that sustainability can be achieved.[45] Furthermore many believe that despite the vast amount of literature and discourses the concept, definition, pillars and principles are still opaque and lack clarity.[46] Thus there is a need for commendable studies through which the policy makers can do some good to the masses. A precise and comprehensive discourse on sustainable development must be constructed to clear the path and formulate the pathway in order to encourage citizenship rather than spectatorship

## The concept of development

Conceptual meanings of development are quite deep and difficult, this could be understood by the fact that many scholars have given their thesis regarding the phenomenon. Definition of development is quite simple and it could be written as "The process in which the lifestyle of humanity changes consistently, dealing with new challenges, the capability of coping with

[45]Justice Mensah, "Sustainable Development: Meaning, History, Principles, Pillars, and Implications for Human Action: Literature Review," *Cogent Social Sciences* 5, no.1 (September 2019): 23.
[46] Ibid, 29.

problems and achievements".[47] Understanding development could be the situation and condition of the society and the satisfaction of people by all the available means.[48] Development is a diverse process by which equality and prosperity should prevail.

## The word sustainability

Sustainability is the capacity to endure in a relatively ongoing way across various domains of life.[49] Sustainability can be written as "human development through a firm economy and a good way of life".[50] The interaction between the people and the environment should be in balance in order to enhance the capabilities and capacity of the people. This proves that sustainability means the way of leading life. This brings spotlight to the thought of satisfying all the needs of the humankind and meeting them using the lowest amount of resources. This also persists in gaining social and economic prosperity.

## Sustainable development

Sustainable development has quite diverse and many different meanings. Literally sustainable development means "development is possible or consistent by the firm the determination of the people for the cause."[51] The main concept of SD will definitely depend upon both the words out of which it is made, sustainable and development. SD has been defined by various sources. SD could be simply defined as "satisfying needs of different generations without debts or social problems".[52]

Sustainable development has a deep effect on everyday life of the people because of the consistent growth in the population with the amount of natural resources decreasing each day. Keeping this phenomenon in mind, there should be equilibrium between the consumption of resources and the people. There comes the real concept of SD, which is equality between the

[48] Menash, "Sustainable Development: Meaning, History," 39.
[49] Ibid, 49.
[50] Ibid, 51.
[51] United Nations, "International Decade for Action on Water for Sustainable Development, 2018-2028," New York, NY: UN Headquarters, 2016. https://www.un.org/en/events/waterdecade/.
[52] United Nations, "Issue 1: Development cooperation in the light of sustainable development and the SDGs: Preliminary exploration of the issues" United Nations Sustainable Development Goal, 2012, https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=761&menu=35.

generations. Sustainability and SD are two distinguished things.[53] While sustainability could be referred to as position and SD could be the gained achievement.

## History of sustainable development

There is no doubt in the fact that SD has become a quite popular subject but still the historical traditions are not as rich as they should have been. In history, economic growth has been the main focus of SD. The dynamic equilibrium between the Earth's resources and the fast population growth has been a debatable issue for the thinkers.[54] The history of SD takes us to 1789 when theories were put forward regarding the statistics of population and the resources. It was essential to take measures for the control of the population in order to maintain balance and prevent the depletion of natural resources.

After some time, with the introduction of modern technology some new thoughts sparked in the minds as with the use of technology of renewing the resources, the occurrence of depletion might not happen. With all this some hazards also came in the way such as, pollution due to the vast production of non-renewable resources to boost the economy. This gave room too many queries. In the 1970s some theories were put forward regarding these issues and it was said that there was a need for taking desperate measures to save natural resources. This was to be done in order to save Earth and humanity from crumbling.

In the 1980s many people had started to think of more suitable ways to protect the environment rather than focusing on tensions caused by the environmental crisis. Politics had to play its part as it seemed to be a political agenda rather than being a subject of science, these were the times when the issue was seen as a global cause. Now a debate arose between the people who wanted the growth to prevail, they could not deny the fact that vast growth did affect the environment but with that they also remarked that it was easy for humankind to search for new resources and some arrangements could be made to control the pollution as well. Another theory on which they advocated was the use of technology to increase agriculture.[55] There would be hi

[53] United Nations, "The Emissions Gap Report 2017: A UN Environment Synthesis Report," *United Nations Environment Programme*, March 2, 2021, https://www.unep.org/resources/emissions-gap-report-2021?
[54] Jacobus A. Du Pisani, "Sustainable development – historical roots of the concept," *Environmental Sciences* 3, no.2 (2006): 83-96, DOI: 10.1080/15693430600688831
[55] Ren Jingzheng, "A Multidisciplinary Approach to the Theory and Practice of Sustainable Development," *Environment, Development and Sustainability* 23, no. 11 (May 2021):17.

tech to overcome the problems of pollution and raw materials needed to enhance industrialization would be present in sufficient amounts. Now, it depends on technology which could counter the issues caused by industrialization and wasteful consumerism.

On the other side, the think tanks raised the points of depletion of resources, increase in birth rates and pollution. Urbanization and accommodation was another issue that rose in the minds. Another issue was hunger and poverty which came with rapid growth. It was essential to be a self-sufficient society and lead a good life rather than depending on industrialization and high tech.

## Sustainable development introduced as solution to growth problems

During the 1960s it was a common thought that modernization can improve the living standards worldwide and with economic growth the development of under developed countries could be brought easily. But soon the truth unleashed in the 70s the thinkers started to believe that economic growth did not meet the needs globally and did not counter inequalities.

In the past both the ideologies, development and conservation have been opposing each other. Development was considered exploiting the resources whereas conservation was considered saving the resources. Now the concept of SD emerged to counter all the threats of depletion. This phenomenon was set to cater to all the issues that might rise with the excessive use of resources.

Sustainable development came up as a corporation and comprises both conservation and development. The term sustainability is defined as standing on a firm stance over a period of time. The term Sustainable development was given by Barbara Ward of International Institute of Environment and Development. The term sustainable development used today was proposed in the 1970s. The phenomenon called for a stable society having a firm stance and determination. The condition of the people should be well and all the needs should be met.[56]

The first conference regarding sustainable development and environmental crisis was held in the UN in 1972 in Stockholm. The underdeveloped world is unable to match the developed world. Underdeveloped world cannot match the developed world because of low amount of

[56] Sharachchandra M. Lélé, "Sustainable development: A critical review, World Development," *science direct* 19, no. 6 (1991): 607.

resources.[57] Such nations should take care of their sufficiency rather than going for development and industrial reforms.

## The Brundtland Commission and popularity of SD

During the 1980s, the UN commissioned a committee consisting of 22 people, called the Brundtland Commission. These 22 people came from developed or developing countries. The main aim of this commission was to cater to the environmental issues rising globally. This commission was called the World commission on Environment and Development (WCED) also known as the Brundtland Commission. A report was submitted by WCED in 1987, which primarily focused on equal distribution of resources, prosperity of the underdeveloped and poor nations in order to boost their economy and meeting the primary needs of the people.[58] WCED was influenced on the point that society, economy and environment can move parallel without crushing the integrity and basic interests of the others. There were many problems such as economic growth, human development, food shortages, suitable accommodation etc whose solutions were discussed in the report. The Brundtland Report mainly suggested the idea of SD instead of conservation or development.

During this time some ecological disasters occurred which made people realize and understand the true meaning of SD and its impact on humanity. The United Nation Conference on Sustainable Development, known as Rio+20 was held in 2012. The primary goal was to take a deep look into two aspects Green economy Institutional framework developing new SDGs to take effect, setting protocols were included in SD. The year was 2012, when SD was considered one of the most prioritized agendas in the UN.[59]

## Criticism

Notwithstanding the social sensitivity of the idea of economical turn of events, there was analysis both from the revolutionary and moderate sides. Less-developed nations were dubious that manageable improvement may be a philosophy forced by the rich industrialized nations to

[57] United Nations, "United Nations Conference on the Human Environment (Stockholm Conference)," United Nations Sustainable Goals, June 5-16, 1972, https://sustainabledevelopment.un.org/milestones/humanenvironment
[58] Bermejo, Roberto, "Sustainable Development in the Brundtland Report and Its Distortion: Implications for Development Economics and International Cooperation," *Research Gate*, January 1, 2010.
[59] United Nations, Sustainable Development Knowledge Platform, "United Nations Conference on Sustainable Development, Rio+20," *Sustainable Development Knowledge Platform*, June 20-22, 2012, https://sustainabledevelopment.un.org/rio20.

uphold stricter conditions and rules on help to non-industrial nations. There were fears that economic advancement would essentially be utilized to support the developed among immature nations.[60]

The significant studies of manageable improvement were that it didn't scrutinize the philosophy of financial development and didn't sufficiently test the customer culture, and was accordingly serving neo-liberal interests.[61] Conservative critics see this as something inevitable that ultimately the resources would decrease given the population is always increasing.[62] From a free-market economy point of view it was contended that supportable advancement arrangements were superfluous, in light of the fact that human creativity would be capable of adapting to the issues of development and improvement.[63]

Among market analysts, there has been a distinction of assessment in regards to the distributional issues identified with maintainability, a center component of the Brundtland Report. As a tradeoff record, the report offers a situation fusing the best, everything being equal: less created nations can work on their expectations for everyday comforts through monetary turn of events, without subverting the development possibilities or the nature of the climate for people in the future. This hopeful situation can be acknowledged on a worldwide scale provided that the created nations can be convinced to become less and to make generous pay moves from 'the west' to 'the rest'.[64] Today it is problematic whether age is willing (or on account of helpless nations ready) to do without utilization and to follow through on greater expenses now, to give people in the future development prospects and great natural quality. Likewise, it isn't not difficult to think about natural quality as an 'item' on the lookout and to add a cost to it. Neoclassical standard market analysts contend that the aggregate sum of capital (counting both physical, human, and regular capital) ought to stay consistent for financial development to happen.[65] This adds up to feeble maintainability in light of the fact that the measure of regular capital is permitted to lessen, as long

[60] Arunkumar Subbaiah, Kishore, Antony, "Integration of DFMA and sustainability - A case study," *International Journal of Sustainable Engineering*,"14, no. 3 (September 2021): 343-346.
[61] Richard Sharpley, "Tourism, sustainable development and the theoretical divide: 20 years on," *Sustainable Tourism*, 28, no 11 (June 2020): 1932-1946.
[62] Ibid
[63] David Wachsmuth, Hillary Angelo, "Green and Gray: New Ideologies of Nature in Urban Sustainability Policy," *Annals of the American Association of Geographers* 108, no. 4 (February 2019): 1038.
[64] United Nation, "Report of The United Nation Conference on The Human Environment," *United nations*, June 5-16, 1972 https://www.unep.org/resources/emissions-gap-report-2021?
[65] Ibid.

as this is made up for by the ascent in different types of capital. Ecological financial specialists are supportive of solid manageability and contend that regular capital (things like clean air) can't be filled in for by different types of capital and ought to thusly not be permitted to diminish over the long haul.

In the second half of the twentieth century, due to the disappointment of monetary development to equitably disperse abundance across the globe and on account of the arising natural emergency, unmistakably previous thoughts of progress, development and advancement had become impractical. The positivistic way to deal with progress, development and advancement, which had been painstakingly understood in the nineteenth and mid twentieth hundreds of years, was overwhelmed by the occasions of world history. Notwithstanding, that didn't imply that convictions in the overall advantages of logical and innovative advancement and of monetary development had been disposed of.[66] In the light of the expense for the planet of development and advancement, of which individuals turned out to be more mindful because of the media inclusion of environmental dangers and debacles, another ethically faultless worldview was vital. This worldview was figured as reasonable turn of events, an idea that could appropriately profess to be the main successor to the ideas of progress, maintainability, development and improvement. It proceeded with the significant strings of the advancement, development and improvement talks of the past and adjusted them to another circumstance of natural emergency, which must be tended to in reality as we know it where the developing hole among rich and poor made any conversation of development and improvement amazingly perplexing.

The phenomenon of sustainable development was a tradeoff among development and protection. The entire discussion around feasible improvement clarified that human-centric perspectives were more grounded than eco-centric views, however that ecological worries had essentially become some portion of advancement talks. Like any trade off, manageable advancement was not completely embraced by one or the other side in the discussion about development and protection, especially those addressing outrageous positions.[67] It was a logical inconsistency in wording, as in certifiable maintainability and veritable improvement would,

[66] J.M. Wittmayer, F. van Steenbergen, A. Rok, C. Roorda, "Governing sustainability: a dialogue between Local Agenda 21 and transition management," *Local Environment* 21, no. 8 (October 2016): 39.
[67] Magnus Larsson and Anders Hanberger, "Effects on sustainable development from large environmental programmes: a review of 16 evaluations," *Journal of Integrative Environmental Sciences* 12, no. 2 (March 2015): 85-105.

according to a puristic perspective, be beyond reconciliation. Maintainable improvement was, in this way, from the beginning open to analysis from both the left and the right. It required further refinement and it would, without a doubt, develop in the resulting many years.

## How are SDGs different from MDGs?

The Millennium Development Goals (MDGs) filled in as an intermediary for economic and social rights but overlooked other significant human rights. MDGs left behind some essential learnings, which made SDGs quite useful and beneficial. SDGs also carried the idea forward. The SDGs put forward the ideas of sustainability, determination, generational equality etc. Some other points such as urbanization and humanity reforms were also raised. SDGs proved quite different and better than MDGs in many ways.[68]

## Universal

The very first issue was the conflict of interest. MDGs were applied on only developing countries where as SDGs were Universal goals applying all over the globe. SDGs were set up to meet the needs of humanity rather than just focusing on the economic growth of developed countries. SDGs made the concept of SD applicable and easy to understand.

## Transformative

As the agenda was for the peace and prosperity of the planet. So the phenomenon of SD came up replacing the traditional concept of development. In this way the approach was far beyond MDGs.

## Comprehensive

The SDGs proved to be quite comprehensive as they had a wide range of ideas to cater the issues of the world. They also proved exceptional, as they were applicable universally. They could bring back a peaceful environment. The coverage of human rights issues was another development that was to be done using SDGs.

[68] United Nations Development Programme, "Transitioning from the MDGs to the SDGs," *United Nations Development Programme*, November 9, 2016, https://www.undp.org/publications/transitioning-mdgs-sdgs?

## The Sustainable Development goals (SDG)

The Sustainable Development Goals (SDGs) were adopted by the United Nations General Assembly in 2015 which are planned to be accomplished by the year 2030. They are remembered for an UN Resolution known as Agenda 2030. Action was to be taken to eradicate poverty, protect Earth and bring prosperity to humanity. This was to be done by setting Sustainable development goals also known as global goals. This was to be done by setting Sustainable development goals also known as global goals. There are seventeen sustainable goal set to achieve are given below:

## Goal 1: End hunger

Eradicating hunger from the world has been an unsolvable issue. Many criminal activities take root due to hunger. Even today there are many countries where food shortage is at its peak. This lets hunger prevail. Many underdeveloped nations encounter stunted growth which causes many problems to the world.[69] The first goal of SD is to end hunger in order to bring back peace and prosperity. The equal distribution of resources and management is essentially required for the cause. Hard work and premium planning was required to meet the needs.

## Goal 2: No poverty

Poverty is one of the major causes of distress and inequality in the world. We live in a modern society but still the nature of human beings is quite the same. Even today, poor are considered inhuman and unequal to the rich. Class difference also plays a very lethal part.

Goal 2 of the SDGs is set for the prevention of poverty from the society. This goal emphasize on social equality and the prevention of social oppression towards the poor. Generally, this goal has some objectives. The very first one is eradicating poverty by all means, eliminating around 50% poverty from the world, social protection, basic human rights are bound to be reserved, basic needs should be met and the use of technology and economic development. These objectives needed to be achieved over the period of 15 years. Effort were made in order to achieve the goal on a high scale. Still, 10% of world population lives below the border of poverty. COVID-19 pandemic has also played its part in increasing the rate of poverty. In many underdeveloped

[69] United Nations, "Goal 1: End poverty in all its forms everywhere," *United Nations Sustainable Development Goals,* https://www.un.org/sustainabledevelopment/poverty/.

nations, the basic facilities such as health and education are available. In Africa alone more than 736 million live under the shades of poverty which according to research may dramatically increase by 2030.[70]

## Goal 3: Good health and well being

Health is a basic human right and should be available for all but, in reality the case is quite different. Health issues have been consistently rising. To cater this SDG 3 is set. Some of the main objectives are reducing the number of maternity issues, prevention of death of infants, ensure the decrease in mortality rate, prevention of communicable diseases, ensuring sexual and reproductive care and giving access to all basic health needs.

Significant efforts have been made to ensure to meet the needs. Works have been done by WHO, access is given to affordable medicine and the increment in the number of hospitals is another step towards the fulfillment of the cause. Philanthropy is another key factor, which has proved quite helpful. The mortality rate specifically the death of children under five has decreased 78/1000 to 41/1000.[71] Still the mortality rate is quite high and this issue has to be dealt with as soon as possible.

## Goal 4: Quality education

Good education is necessary for leading a good life in today's modern world. In the modern era, everyone wants to have a good lifestyle and for this one needs to be well educated. Education, not only builds character but also lets you differentiate between right and wrong. Quality education ensures an elevation in living standards.

SDG 4 is set in order to deliver quality education all over the globe. There are some primary objectives of SDG 4. Primary education for all, affordable education, spreading technical education, increasing literacy rate, a no discrimination in education agenda , better future and an overall quality education for sustainable development.

[70] United Nations, "Goal 2: Zero Hunger." *United Nations Sustainable Development Goals,* https://www.un.org/sustainabledevelopment/hunger/.
[71] Department of Economic and Social Affairs Sustainable Development, "Goals 3 Ensure healthy lives and promote well-being for all at all ages," *United Nations*, https://sdgs.un.org/goals/goal3.

The primary ways sorted out for this purpose are increasing the number of institutions, higher number of scholarships and increasing the grant of qualified teachers. Effort are made to provide quality education, especially the primary education. UN have worked a lot to cater this issue. NGOs have also proved helpful in this noble service. 50% of the out of school children are in the schools and work is being done to provide quality higher education.[72]

## Goal 5: Gender equality

Women empowerment is something, which divided the society into two groups, the miscellanist and the feminist. Today, we have forgotten the genuine morals of gender equality. Gender equality should be achieved on all costs. Women empowerment is also necessary, especially in such nations where domestic violence is on its peak.

SDG 5 pursue this cause and is set to grant equal rights to both, men and women. In the recent to too much work is done regarding the matter. In the underdeveloped and developed countries many efforts are made counter the threats to gender equality. Media has also played a vital role. In 2020, the number of women representatives increased in the parliament from 22% to 25%. Women are now involved in decision making.[73] There are many women working in public offices and in the civil services

## Goal 6: Clean water and sanitation

Making sure the availability of clean water and sanitation for all is the main objective of SDG 6. The main targets, needed to be achieved are affordable water for everyday use especially drinking, providing sanitation and ending defection, improvisation of water quality. Water waste management. And the reuse of water and water resources. Some main ways to counter the issue are recycling and restoration of water.

According to WHO around 4.5 billion people don't have access clean water and sanitation. In the underdeveloped countries especially, North Africa and South Asia this crises is rising day by day. As per United Nations, the population of Pakistan will increase to round about 380 million

[72]*United Nations,* Department of Economic and Social Affairs Sustainable Development, "Goals 4 Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all," *United Nations*, https://sdgs.un.org/goals/goal4
[73] Department of Economic and Social Affairs Sustainable Development, "Goals 5 Achieve gender equality and empower all women and girls," *United Nations*, https://sdgs.un.org/goals/goal5

in 2050. Experts believe that by 2050, half of the population of the world will be facing the water crisis.[74]

The conference (Agenda 21) will address some of the major implantation problems relating to four major themes like water, sanitation and hygiene, water resources water quality and risk. In connection to the objectives suggested by the open waged development goals and UN water. 6 goals were suggested by the open working group: "ensure and sustainable management of water and sanitation for all".first goal was the Universal and equitable access ensures to clean and cheap drinking water for everyone by 2030. Second goal was all people by 230 will have access to sufficient, appropriate sanitation; hygiene and open sewage will be eradicated with a specific focus on the needs of women and girls, as well as those in precarious circumstances. Third goal was water quality can improve by 2030 through reducing pollution, eliminate dumps, and minimize the production of hazardous chemical and material. Also decrease the amount of drainage swage water, increase recycling and safe reuse by percent worldwide. Fourth goal was to combat water shortage, significantly boost water productivity throughout all areas by 2030 secure sustainable demands and supplies of ground water to minimize the number of people affected by shortage of water. Fifth goal Establish effective water resources planning at all stage by 2030, such as where necessary, through international collaboration. Sixth goal was All water related landscape like hills, rivers, dams, forest and lakes must be protected and restore by 2020 the targets that should be achieved in 2030 were, to support for developing country by 2030 increase international collaboration and capacity building in water and sanitation related services and projects such as irrigation system, water recycling distillation, and reusing technologies. And To improve water and sewerage system, encourage and support regional public participation. Various water and sanitation targets word by word are presented as**:**

- Eliminate neglected disease in the world by 2030 like hepatitis, malaria, Hiv, Water borne infection and other infections.
- Decrease the quantity of fatalities and diseases caused by hazardous substances as well as environment pollution of the air and soil by 2030.
- reduce the number of death causalities and affected individuals as well as financial

[74] Department of Economic and Social Affairs Sustainable Development, "Goals 6 Ensure availability and sustainable management of water and sanitation for all," *United Nations*, https://sdgs.un.org/goals/goal6

damage by 2030 due to disaster particularly water related catastrophes by y percent related to Grass domestic products with an emphasis on safeguard the impoverished and person in vulnerable situations.

- By 2020 according to the international framework accomplish ecologically sound management of chemicals and all wastes throughout their life cycle, and drastically reduce soil to limit their negative consequences on human health and environment.
- According to the international agreement by 2020 ensure that land and inland ,fresh water, ecological system, marches, mountain and deserts are conserved restore and used sustainably
- Develop steps to prevent the entry of alien species and severely decrease their effect on land water ecosystem by 2020, as well as manage or destroy different types.

## Goal 7: Affordable and clean energy

SDG 7 is to make sure that everyone can afford and access sufficient energy. The objectives of goal 7 is to supply clean and energy all over the globe, increasing renewable energy source, increasing and the production of efficient energy.

To meet the needs, research has to be done, inexpensive and reliable sources of energy are required. In the recent past development is done on a very large scale and with that the requirements of energy are also increasing. International Corporation is required to meet the needs of the underdeveloped countries. Efforts are made in order to counter the energy crisis. Billions of people have accessed electricity in the recent past, especially in Africa and South Asia.[75]

## Goal 8: Decent work & economic growth

The first of two objectives of SDG 8 is to bring economic sustainability and to promote economic growth. The second one is the assurance of proper employment for all. The respective targets of SDG 8, meant to be achieved in ten to fifteen years are sustainable development in economy, upgrading and updating economic growth, increasing the number of employment opportunities, balance of consumption and production, propel and gender elite, equal and decent

[75] Department of Economic and Social Affairs Sustainable Development, "Goals 7 Ensure access to affordable, reliable, sustainable and modern energy for alll," *United Nations*, https://sdgs.un.org/goals/goal7

earning, technical education, end modern slavery, human trafficking, reservation of rights of all working classes, safety of workers, development in tourism, and setting a global development program.

In the recent past, there has been some development in the economic sector. In underdeveloped countries, the economic growth rate has increased to 4.5 percent. Till 2019, 22% of the world youth was either unemployed, not training or uneducated. By 2018, the number of women in labor force was 48% while the men were 75%.[76]

## Goal 9: Industry, Innovation and Infrastructure

Industry is the backbone of any nation. Although just industry is not required to run a country smooth, but it would not be wrong to say that industry plays a vital in the outcome of a prosperous future of a country. Same goes with infrastructure as well. Without a good infrastructure, industry doesn't proves to be as fruitful as it should be. The main focus of SDG 9 is on both the topics mentioned above. The main objectives of goal 9 are to provide resilient and reliable infrastructure, renovating the present industrial sectors as well as constructing new ones, boosting industry globally, making the market easy to reach, keeping the industry and Infrastructure up to date and bringing innovation in the fields of industry and Infrastructure. Some other objectives of goal 9 are providing underdeveloped or developed nations with sustainable industrial development and global access to information communication technology.

According to a research in 2019, around 14% of the world population was working in manufacturing industry. Around 18 percent of which is in East Asia and just 6 percent in North Africa. Emission of Carbon dioxide has also decreased Up To 25%. The decline of emission of Carbon dioxide has also decreased air pollution. Today, the whole world is connected by mobile networking but still accessing internet is not that easy. This is either because of cost, connection or other problems. Even today, the internet using population of the world is just 53%.[77]

[76] Department of Economic and Social Affairs Sustainable Development, "Goals 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all," *United Nations*, https://sdgs.un.org/goals/goal8
[77] Department of Economic and Social Affairs Sustainable Development, "Goals 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation," *United Nations*, https://sdgs.un.org/goals/goal9

## Goal 10: Reduced Inequality

Inequality has been one of the biggest and ongoing issues of the world. This issue has also given birth to income inequality. Goal 10 of the sustainable development focuses mainly on the reduction of income inequality. The outcome objectives of goal 10 are reduction of inequalities, providing equal social and economic opportunities to all, implementing policies on an upper level for the promotion of equality, eradicating discrimination, incriminating the representation of underdeveloped countries in world market. The means of achieving goals are initiating consideration for underdeveloped countries, initiating new development policies for investment in the underdeveloped countries and the reduction of costs.

During a period of 5 years from 2012 to 2017, the bottom 40 percent around 73 countries of the world especially the underdeveloped countries has seen income growth. The case would not be the same, if seen globally. In most countries the overall gain of the bottom 49% population would be less then or round about 1/4th of the total earning.[78] Discrimination has affected the people on a greater scale. Women have become the victim of discrimination as compared to men. Disability, ethnicity, religion and sex are counted as the main causes of women discrimination. The need to cater such issues have rose quite rapidly. In the recent past, steps have been taken in many nations to fight the problem on higher level.

## Goal 11: Sustainable cities and communities

The Sustainability and safety of cities and communities is the major idea of goal 11. The main outcome objectives of goal 11 are easy and affordable accommodation, sustainable transport, urbanization, good and sustainable living standards, culture and nature protection, sustainable disaster management, reduction of adverse effects on urbanization. The number of slums have rose quite rapidly, round about 25% of the urban population was in urban slums in 2018. The dramatic rise in slums was seen in south East Asia and North Africa. According to a research, in 2019 half of the world population could access affordable transport on walking distance. 1990-2015 was the period which saw a dramatic increase in urbanization.[79]

[78] Department of Economic and Social Affairs Sustainable Development, "Goals 10 Reduce inequality within and among countries," *United Nations*, https://sdgs.un.org/goals/goal10

[79] Department of Economic and Social Affairs Sustainable Development, "Goals 11 Make cities and human settlements inclusive, safe, resilient and sustainable," *United Nations*, https://sdgs.un.org/goals/goal11

## Goal 12: Responsible consumption and production

The central idea of goal 12 is the balance and sustainability between consumption and production. The targets of SDG 12 are to build and implement a 10 year framework on consumption and production, management and efficient use of resources, globally decreasing the food waste per Capita, food waste management, controlling food shortage, boosting production without declining the principles of SD, environment friendly waste of chemicals, reduction of waste, preventing, reducing and recycling of waste by any means, spreading information regarding the issue in every possible part of the world, setting waste management committees throughout the globe from a very small scale to national level, monitoring the balance between consumption and production.

In 2019, the EU and many other countries had reported of having a definite policy to have sustainability between consumption and production. In 2018, the global fossil fuel production was of $400 billion, this helped in tackling the high emission of Carbon dioxide.[80] The recycling of plastic products, less wasting and consumption, careful waste management is required to help settle the "plastic hazard".

## Goal 13: Climate action

The main concept of goal 13 is to prevent climate change and counter the effects it has on environmental conditions. The main targets of the SDG 13 are having a strong resistance to disasters caused by climate change, drafting policies to take measures to meet climate change, increasing the capabilities to fight such a threat. The use of modern technology to manage climate change in a mechanized order is another goal of SDG 13. The years 2010-2019 were considered the warmest period in the history of mankind. Climate change doesn't only effect the life style but it also has a great impact on world economy. Temperature is constantly rising having a very unpleasant effect on the environment. Consistent rise in temperature causes the occurrence of many natural disasters such as floods, wildfires, cyclones etc. From 2000s onwards steps have

[80] Department of Economic and Social Affairs Sustainable Development, "Goals 12 Ensure sustainable consumption and production patterns," *United Nations*, https://sdgs.un.org/goals/goal12

been taken to cater the issue. The greenhouse emission has been brought in control in many developed countries.[81]

## Goal 14: Life below water

The concerned idea of goal 14 the sustainable usage of water reservoir, resources and oceans. The main outcome objectives of goal 14 are protection of ecosystems, declining marine pollution, eradicating the wastage of chemicals into ocean, sustainable fishing, reducing overfishing, and raising economic growth from the better use of marine resources. The achieving goals are implementing laws, economic growth using marine industry and raising small scale fish industry. Oceans cover around 70% of Earth, being the largest ecosystem on the entire planet.[82] It houses around 1 million species known to men. It is a great source of economic and social needs fulfillment of global population. Life is nothing without water, almost half of the population of the world depends upon ocean. But, with the industrial growth the acidification of ocean has increased quite significantly. Although, efforts are being made but still a significant change could not be seen. The best reason that could be given is fish smuggling and illegal fishing. These practices have proved quite harmful to the ocean and the whole environment. Implementing law is essential for saving water resources and reservoir.

## Goal 15: Life on land

The 15 number of SDGs is to secure and protect the eco system which includes managing of forests to battle desertification, and stop and opposite land corruption and end biodiversity misfortune". The targets includes fresh water eco system and stop deforestation or restore dead forests. And also protect biodiversity and natural surroundings. This objective targets getting practical jobs that will be delighted in for a long time into the future. The human eating regimen is made 80% out of vegetation, which makes agribusiness a vital financial asset. Vegetation gives 80% of the human eating routine, and we depend on farming as a significant monetary assets. Woods cover 30% of the Earth's surface, give fundamental natural surroundings to a huge number of animal types, and significant hotspots for clean air and water, just as being urgent for battling

[81] Department of Economic and Social Affairs Sustainable Development, "Goals 13 Take urgent action to combat climate change and its impacts," *United Nations*, https://sdgs.un.org/goals/goal13

[82] Department of Economic and Social Affairs Sustainable Development, "Goals 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development," *United Nations*, https://sdgs.un.org/goals/goal14

environmental change. “Desertification affects as much as one-sixth of the world's population, 70% of all dry lands, and one-quarter of the total land area of the world. It also leads to spreading poverty and the degradation of billion hectares of cropland. A report in 2020 stated that globally, the species extinction risk has worsened by about 10 per cent over the past three decades”[83].

## Goal 16: Peace, justice and strong institution

Building up strong societies, strengthening people and giving a good stance and justice for all is the main idea of SDG 15. The main objectives of the goal include protection of human rights, eradicating all sorts of child abuse, no violence, peaceful society, maintenance of law and order, Justin for all, eliminating corruption from the society, strong institution, check and balance, good governance, fundamental rights should be reserved, freedom of speech and legal identity. Whereas, the achieving goals are making the instructions strong to make the society peaceful, prosperous and crime free; laws regarding discrimination. Countering violence, sexual harassment, child abuse and trafficking are the clear objectives. Globally a good judicial system is required for law enforcement, implementation and eradicating such evils to make the world a better place. In some countries no registration of children is done and this gives birth to criminal activities. During a survey it was found out that 1/5th of children are not registered. Bribery is another issue that had crept into the society and had to be taken out.[84]

## Goal 17: Partnership for the goals

Strong implementing and creating a good global partnership to have SD is the main idea of goal 16. The goal 16 mainly focuses on corporation between the nations for the betterment of humankind rather than nations matching up with one another. Sharing and spreading knowledge and technology especially to the underdeveloped countries would make the whole world prosper. The public-private partnership is essential to achieve great results.

[83] Department of Economic and Social Affairs Sustainable Development, “15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss,” *United Nations*, https://sdgs.un.org/goals/goal15

[84] Department of Economic and Social Affairs Sustainable Development, “Goals 16 Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels,” *United Nations*, https://sdgs.un.org/goals/goal16

Although the requirement investment of $5 to 7 trillion was not met and in 2017, just 147.2 billion could be gathered up. Many crises such as war on terror and disasters require money and countries do have requirements for trade and growth.[85]

## Sustainable development ensures water security

Water insecurity is a major issue that consistently rises and has proved quite hazardous during economic development. We know that without water life is impossible. In SDG 6, the importance of water has already been briefly discussed. We know that for the elimination of hunger, poverty and economic disability, the main source that would be used is water. Water management and use of water resources plays an important role in completion and implementing all the SDGs. Water related crises are needed to be dealt with in a swift manner in order to gain what is required. Proper water management is required, which may not give unlimited access to water for all. But, it will definitely help in increasing the number of water reservoir and fighting the water crisis. Water crises is one of the major issues of the world and always stands on top of the table.

According to world economic forum, water crises comes in top three issues of the world. Occurrence of disasters is constantly increasing, droughts and floods are all because of water scarcity. Water crises has quite devastating effects on humanity as well as the planet. The goals that are need to be met, could only be achieved, a corporative action is required by both the UN and its members. 2018-2028 was proclaimed as the international decade for action. The resolution was passed in order to have coordination and cooperation between nations to overcome the water crises quite swiftly. The decade officially started on 22 march, 2018 which was commenced as the world water day and would be completed on the same day in 2028. The objectives of the resolution mainly focus on having sustainable development, management of water resources to have social and economic benefits globally. Partnerships are required from a very low level to the peak in order to meet the requirements. UN, acting as the main body the SG has to take effective steps towards planning the management of water with available resources at global level. Furthermore the resolution indicates that the SG should form policies and agencies with the cooperation of governments of developed nations to carry out the fight against water crises. A task force was

[85] Department of Economic and Social Affairs Sustainable Development, "Goals 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development," *United Nations*, https://sdgs.un.org/goals/goal17

created by UN water in order to meet the challenges and be helpful to the SG to draft the coordinative plans in order to eradicate water scarcity. After some efforts the task force did manage to make up the draft action plan, which shows the current situation as well as giving us the idea of how to deal with upcoming challenges.

## Advance sustainable development

Sustainable development totally depends on water, saying this would not be wrong. We already know that without managing saving water resources the social, economic and environmental development might not be possible. So, we know now that without water management the stance of SD May not stand. The world is on the verge of chaos, with that unsustainable development plays its own part in it. The reduction of water resources and reservoir along with bringing down social benefits and increasing disasters have made Earth not a very suitable place to live. The required water rate is consistently growing and it may increase UpTo 55% by 2050.[86] To cater the issue a balance between the supply and demand has to be made. Now, the main targets of the decade are to bring sustainable development and a risk known water management system. This has to be done in order to achieve the environmental, social and economic objectives. The resolution still wants corporation between the nations for the noble cause of saving humanity. The use of modern technology and science to get innovative ways of saving water resources.

## Energize implementation of existing programs and projects

Efforts are being made in order make safe water and sanitation easily reachable to all. To implement such measures the UN, public sector and society are striving hard. Reduction of pressure, restoration of ecosystems, managing and restoration of water resources. Controlling disasters and reduction of water pollution. The ongoing and present projects include social and national partnership to make water management easy. Global cooperation to cater water issues. The decade has given us the opportunity of global cooperation to energize ongoing projects and increasing capacity development.

[86] Francesco Mancini, "Managing Change at the United Nations: Lessons from Recent Initiatives," *International Peace Institute*, OCTOBER 2015, https://www.ipinst.org/wp-content/uploads/2015/10/IPI-E-pub-Managing-Change-at-UN.pdf.

## Mobilize actions to achieve the 2030 agenda

Agenda 2030, concerns itself with the water security as the core issue. Sustainable water management will in turn play a pertinent role in achieving sustainable development goals. Goal 6 of sustainable development proclaims that water must be made available through management. It encompasses multi-faceted theorems regarding water management. Its Main concerns revolve around issues of drinking water, sanitation, and hygiene, but at the same time it builds up a proportionality with global political activity and sustainability of water resources. Goal 6 is interlinked with other 16 goals.[87] Other goals cannot be achieved with indifferences with this goal. Agenda 2030 reinforces the need of the focus on water sustainability vis a vis sustainable development.

Agenda 2030s vision is quite pertinent and clear in this regard it chalks out the necessarily principles and framework to mobilize action and set out dialogues, cooperation, and partnership at cardinal levels and on all levels in the hierarchy. Development cannot be achieved if agreed upon goals and targets are not formed at international levels. This may seem a very ambitious project, but the results may differ radically if these goals especially goal 6 is relegated.[88]

It is obvious that a framework is needed to the constructed and structural form of mapping is needed. National, sub national and international organizations and entities can play a commendable role in the implementation of SDG 6. Moreover, political, and social organizations at national levels can play a formidable part. A framework must be formulated. Its systematic topology can be constructed under three major points or agendas.[89]

## Ideas and knowledge access coupled with innovative ideas and practices

The first and foremost issue revolves around the literature and the dissemination of knowledge related to water sustainability. Initially, even UN water members and partners have taken a concrete step by designing an outstanding and interactive website. The core feature of this website is to engage and create participation and at the global level as an initial step it is a good

[87] United Nations, "Launch of the International Decade of Water for Sustainable Development 2018 – 2028," *United Nations*
[88] Sustainable Development Knowledge Platform, "Water and Sanitation," *Sustainable Development Knowledge Platform,* https://sustainabledevelopment.un.org/index.html
[89] Sustainable Development Knowledge Platform, "Home," *Sustainable Development Knowledge Platform,* https://sustainabledevelopment.un.org/index.html

development. However, still the management of water sustainability is not layered among the masses. Individuals even many organizations lack the very basic knowledge of SDG 6.

Moreover, there is a dire need of accessibility to the knowledge and literature member states must show their commitment and play their role to formulate a coherent policy vis a vis water sustainability. Those members who have successfully attained and managed water sustainability must show and motivate others through their experiences. Issues such as water related disasters climate change adaptation and ecological differences must be resolved and catered by public private partnership at rational as well as international levels agenda 2030 concerns that focus must be maintained on accessing and extracting valuable and reliable data vis a vis water sustainability and development. By attending and organizing the extracted data new and cost-efficient methods can be employed for plans.[90] Agenda 2030 exercises will create, organize, and advance the deception of new sustainable projects, which are relying upon intellectually solid innovations to empower member states to fortify their capabilities, member states must be equipped as such as in such a manner that member states are easily able to cope with the problems of water related hazards floods and droughts. All these factors lead to water shortage.

## Improving the knowledge and generating knowledge proportionally with SDG6

Another task ahead would be the refining of knowledge and improved form of knowledge abrupt climate change, increase in the natural hazards and catastrophic, coupled with policies which are radically under unaware of SDGS. Therefore, a knowledge-based analysis is needed, and policies are constructed keeping in mind the dynamics of these phenomenon. UN has taken some cardinal steps in this regard. However still member states must take this serious and play a proactive role vis a vis water sustainability. Member states must acquire the very basic knowledge regarding SDG 6. They must inquire the UN regarding these issues. The involvement of UN and other custodian agencies show the growing concern international community has with the SDG six.[91] The work of WHO/UNICEF joint monitoring program for water supply along with other agencies such as JMP for sanitation and hygiene is very good. Moreover, the UN water global

[90] United Nations Foundation, "Helping the UN build a better world," United Nations Foundation, https://unfoundation.org/.
[91] United Nations Department of Economic and Social Affairs, "International Decades for Action "Water for Lift," 2005-2015," *United Nations Department of Economic and Social Affairs*, https://www.un.org/waterforlifedecade/index.shtml

analysis and assessment of sanitation and drinking water (glass) also made it quite clear that with water sustainability, the achievement of development is the working in fool's paradise.

Therefore, there is a need of scientific research projects intending to progress practical improvement must be executed within the next decade governmental change must not stop the progress in sustainable development. Developmental projects must be formulated with proportionality to SDGS rather than governmental change. Institutions such as Homeland Security of US must be created by other member states. And disaster management institutions and policies must be constructed on temporary and long-term basis. These activities will encourage improvement in water sustainability and may be quite helpful in fulfilling water related SDG's

## Promoting partnerships and coordination's for SDG 6

Water resources playing an important role in the sustainable development from clean water to agriculture, Sanitation to industries, fizzy products to construction almost everything relies upon water availability. The gentry and the developed may be able to counter this challenge for sometimes. However, one must not forget that eventually this problem will lead to catastrophic and at global level therefore member states must take concrete steps and must cooperate at all the levels to come up with a plan to manage water resources.[92] Public awareness gatherings for development projects etc. It will help in coordinating between public and private stakeholders.

Human development is needed badly droughts floods and famine will create problems for the masses. Moreover, surge in the population further did deteriorate the conditions. Drinking water, for domestic and industrial use is necessary if not available the whole social and economic fabric maybe turn up water scarcity in turn will create water insecurity in a country which are experiencing object poverty lawlessness and corruption are more fragile to water insecurity. Migration crisis coupled with poverty will create polarization in the society. Moreover, if this trend accelerates it may create radical social problems and lawlessness in the society. It will equip techniques ill-mannered policies and orthodox and condemned methodologies are failing to answer the very basic anomalies generated due to water scarcity.

[92] Department of Economic and Social Affairs Sustainable Development, "Goals 5 Achieve gender equality and empower all women and girls," *United Nations*, https://sdgs.un.org/goals/goal6 .

National and global improvement is needed badly to counter the problem of water scarcity superficial and vague ideas must be annulled. Innovative and dynamic frameworks must be introduced to tackle this problem. Water scarcity concerns itself with the primary needs of the society. If primary needs of the humans are not fulfilled it will have an inevitable effect on the secondary and tertiary needs. This in turn will deteriorate and turn up the social fabric of the society, which will ultimately result in the decay of the society.

********

## CHAPTER 4

## BALOCHISTAN: SOCIO-ECONOMIC DEVELOPMENT

# Introduction

Water as a source is needed for the direct consumption, coupled with social economic development of the region in 2018. United Nation Water Development Report postulates that around 3.6 billion[93] people reside in a place where water table is extremely low. Furthermore, the abundance of water resources are also depleting in those areas. One can formulate an assumption that almost 50% of the world population are facing major water crises. Pakistan is one of those countries which are also on fault line. IMF presented a report in which Pakistan was ranked third in the list t of countries facing water shortage. Another alarming report was presented by Pakistan Council of research in water resources PCR WR, which indicates that by 2025, Pakistan will reach the bottom line vis-a-vis Water Resources. Superficial ideas regarding water security measures some illuminating data but a deep study postulates that one water abundant Pakistan, is now our water stressed Pakistan. Annuual per capita water availability in Pakistan dropped to 1384 meter in 2002. Population action international (2002) retreated that Pakistan may experience severe scarcity by 2025. Studies showed that in 1991, 97% of water usage was primary for aggregation purpose, whereas 3% is used for domestic and industries.[94] Hydrological definitions may conclude otherwise, nonetheless, Water stress, poor water management and inequitable supply of water have an alarming effect on the masses one can assume or presume that the core issue is that of water management rather than water scarcity.

A development at developing countries like Pakistan, with an agrarian economy, has to rely upon water resources, social prosperity and economic growth is directly proportional to the water availability. Having said that, Pakistan is also facing massive urbanization, therefore increasing in the demand of water but the availability of water is stagnant. Moreover, climatic change and rapid increase in the pollution further delay deteriorated the problem of water scarcity,

[93] Wazir, Muhammad Asif, Goujon, Anne, "Assessing the 2017 census of Pakistan using demographic analysis: A sub-national perspective," *Vienna Institute of Demography Working Papers, No. 06/2019, Austrian Academy of Sciences (ÖAW), Vienna Institute of Demography (VID), Vienna,* (2019), https://www.econstor.eu/handle/10419/207062

[94] Maheen Hassan, "Civil Service Reforms in Pakistan," *Development Advocate Pakistan* 3, Issue 3 (September 2020): 13-22, file:///C:/Users/Hp/Downloads/DAP%20September%202016.pdf

if concentrated and formidable steps are not taken, food and water inefficient insecurity will widen the crevices between the wealthy and the poor, thereby igniting the already vulnerable segments of the society in true hardship and inequalities[95] There is a stark rose in the events like droughts and floods, climate change further extrapolate this problem these phenomena threaten the very foundation of the economy of Pakistan. Many people are solely dependent upon agriculture and exploitation of natural resources. The increased competition over scarce water resources and food, excreted by climate change are a matter of life and death for poor communities.[96]

Access to freshwater is a universal right of every human being. This natural resource has great impact on social, economic resources of humans and therefore it is a key instrument in meeting the sustainable development goals. However, still there are millions of people who are suffering because of depleting water resources. The water resources are diminishing to such A to such an extent that even world leaders, researchers and journalist has predicted that the next World conflict could be caused due to the water scarcity issues. Yet the world is not serious about such a severe issue and has turned its back to it. Most of the world consider it as a national renewable resource that would not diminish as nature is recharging it. However, the increasing population and the increased demand of water has made it very difficult for the nature to keep with the demands of humans. If these habits of humans and unsustainable use of resources do not change then the global water scarcity classes would surely deepen more and could become the major cause of word conflict there are many causes of water crisis, one major cause of this crisis is that this issue is not considered as a universal issue because of lack of interest of world governments and their inability to contextualize it as a multidimensional problem.

In case of Pakistan there are various challenges that Pakistan is facing due to water. Pakistan challenge is that it has to protect human health and life from water scarcity, pollution, unequal distribution and water related natural disasters. All of these issues severely impacts the human development. The former section has highlighted the inability of water management in providing safe water to all users. The government in order to provide an access to safe water supply has chalked out 10 years perspective plan with the Millennium Development Goals. The constitution of Pakistan through article 38, has guaranteed that it is the responsibility of the state

[95] Giordano, M, "Global groundwater? Issues and solutions," *Environ* 2, no.4 (September 2020): 23-75.
[96] Mohammad Yousuf1 and Mohammad Nasir, "Vulnerability Factors and Socio-economic Impacts of Drought in Balochistan: A Case Study of District Nushki," *Balochistan Review* 12, no. 1 (February 2016):79-93.

to provide basic necessities of life irrespective of sex or social economic background. The government as we know has chalked out a10 year's perspective plan but its reduced engagement to that plan has raised questions regarding the seriousness of government. In order to achieve the goal of providing basic necessities particularly the water following points are mandatory to be considered. Such as the voices of all stakeholders are to be taken on board simultaneously in particularly of women and the poor in water management. Economic incentives if provided can boost the access of water to manage marginalized and the maximum use of the scarce resources.

Water security is a fact, It's undeniable, Many may disagree but a deeper look at the arid and semi-arid area may reveal that fact low precipitation coupled with floods further exacerbate this problem Moreover, population growth expansion in agriculture and urbanization further deteriorate the problem of water insecurity unfortunately, Pakistan lies in arid or semi-arid zone. Moreover, Balochistan, the province with the largest area faces severe aridity and low precipitation. Given, its geopolitical position. Pakistan cannot afford to leave Balochistan in this condition. The province of Balochistan, an arid mountainous region. Due to its vast area and harsh climate.

Less dumb type of culture is generated a culture that is conditioned in such a way that people feel easy to survive. In the rugged and harsh landscape. Moreover, unfortunately, this province has gone through a series of protected calamities, especially droughts have compelled the masses to go through migration from time to time eventually this resulted in loss of crops, livestock and other forms of employment. It is quite pertinent that shortage of water is the main reason behind this due to severe problem, naturally and at policy level surface water resources are negotiable. The only available water resources is the groundwater. However, water table has declined exponentially.

Due to massive urbanization and ill-mannered policymaking and equilibrium should be maintained between abstractions and the recharge of water according to the Sustainable Groundwater Management. Through sustainable policies and management techniques, groundwater obstructions can be abated. Moreover, artificial methods can be employed to increase the charge several method can be used to appreciate this process. For instance, to fulfill the task of recharging delay action dams can be introduced. Moreover, an effective and economical irrigation system can be introduced to control the abstraction. It is highly recommended that a framework

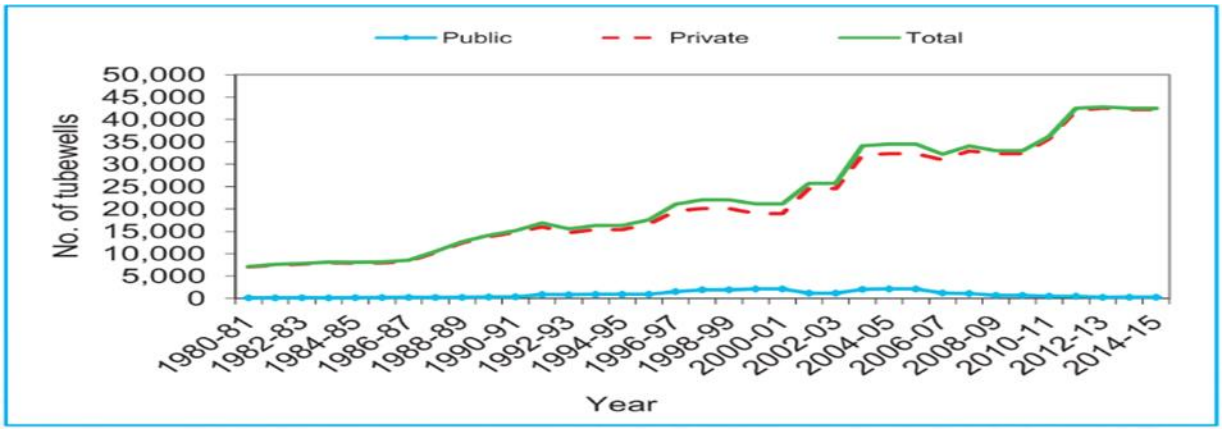
and a blueprint should be formulated vis-a-vis this problem. The fulfilment of this task can be achieved any sort of authority for the management of groundwater resources. The mandate should be precise and transparent. Regulation of water resources through natural and artificial techniques, thereby maintaining a sufficient equilibrium between the abstraction and the recharge. The annual precipitation is low in Balochistan, the annual average precipitation is around 200 millimeter. On the other hand, evaporation rates are high, ranging from 2000 to 5000 millimeter per year. Moreover the population of Balochistan has increased from 6.5 1 million in 1998 census to 12. 34 million in 2017. This resulted in exponential in the increase in the food and water demand.[97] The harshness and diversity in the climate have added to reach animal and plant biodiversity thereby creating such traditional values that promote evidence in the tough and harsh area. Still, the province is facing to cope with the scenario within the province. Recurring droughts coupled with poor water management resulted in migrational crises. The results are obvious loss of livestock, unemployment, loss of orchards and cash crops. Only 2.0 7 million a hectares are being cultivated out of 19. 4 million hectare. The age old system of karez is nowhere to be seen. Moreover, water sources are depleted. Water table is decreasing at alarming level due to over exploitation of water resources. Having said that, it is quite impossible to cultivate the total land which is around 20 million hectare areas.[98]

## Groundwater resources of Balochistan

The main source for the irrigation domestic and industrial use is groundwater. Rainwater is negligible and unable to compliment. Large rivers and its tributaries extraction through dug wells, tube wells and kareaz are the method mostly employed for domestic use. Balochistan is also known as the fruit basket of Pakistan in 1992 to 1993 and area of 660 Kilometer was cultivated for food production, whereas the area has increased to 2310 kilometers in 2012 to 2013R. Around 1.9 2 billion cubic meter BCM of water is needed.[99] For the irrigation of these orchards and crops. Mostly the real reliance is upon groundwater due to introduction of transmission and Electric City Lines. With subsidized rates, the trend shifted towards tub wells there has been an exponential

[97] Mustafa and Usman Qazi, "Transition from Karez to tube well irrigation: development, modernization, and social capital in Balochistan, Pakistan," *World Dev* 7, no. 35 (July 2019): 1796.
[98] Government of Pakistan, Planning Commission, "Multidimensional Poverty in Pakistan," *Oxford Poverty and Human Development Initiative-University of Oxford*, https://www.ophi.org.uk/wp-content/uploads/Multidimensional-Poverty-in-Pakistan.pdf
[99] Muhammad Ashraf, and Ashfaq Ahmed Sheikh, "Sustainable Groundwater Management in Balochistan," *Pakistan Council of Research in Water Resources Islamabad – Pakistan* (2017).

increase in the drilling of tube wells, the number of tube wells increased from 5000 to 40,000 for the year 1980 to 2015.[100]*Number of tube wells 1*




Source: https://pcrwr.gov.pk/wp-content/uploads/2020/Water-Management-Reports/sustainable-grndwtr-in-balochistan.pdf.

In any case, this improvement has additionally impacted the maintainability of the groundwater assets. In spite of significance of groundwater in Balochistan, no appropriate groundwater observing framework exists to manage its use.

The decrease in groundwater table is ascribed to broad groundwater abstraction and wasteful utilization of the siphoned water. The unnecessary groundwater deliberation has brought about bringing down of water table upto 5 m for each annum in some valleys, causing groundwater mining particularly in Quetta, Pishin, Mastung and Mangochar. The situation with water of tubewells in the Quetta Valley presents further bleak circumstance of groundwater. This has come about in light of unreasonable and profoundly wasteful utilization of water for water system where water misfortunes are colossal. The present circumstance can't be permitted considering the always expanding hole between water interest and supply.

Therefore, the groundwater balance in a large portion of the basins of Balochistan is showing negative water spending plan, which is disturbing particularly against the developing interest for practically all areas. The maintainable groundwater the board requires that there ought to be a harmony between water deliberation and re-energize. As the groundwater reflection is more

[100] Ashraf, Sheikh, "Groundwater Management,"12.

than the re-energize, subsequently, endeavors are expected to re-energize the spring misleadingly and furthermore to lessen the deliberation by utilizing more proficient water system strategies.

Realizing gravity of the problem of groundwater depletion, special attention was given by the Provincial Departments in 90s to recharge the groundwater aquifers by harvesting runoff. For this purpose, about 300 delay action dams have been constructed in the province during the last few decades. Pakistan Council of Research in Water Resources (PCRWR) introduced the concept of leaky dam in Balochistan. As the name implies, it leaks water slowly at the downstream of the dam at the rate it infiltrates into the groundwater. PCRWR introduced leaky dam activities at five different locations in Balochistan viz. Marget, Panjpai, Kan Meterzai, Chashma Achozai and Pishin Bagh. The idea is to reduce the velocity of flow, and recharge at the downstream of the dam Such dams are economically and technically viable in areas where construction material is easily available and seasonal streams are relatively permeable for transmitting surface water to the aquifer. In this way, the leaky dam could be a good substitute for traditionally used delay action dams facing problems of deposition of silt and high evaporation losses. Apart from that there are other means of water depletion such as Check Structures/Bunds, Inverted wells, Water shed Management a number of other small structural measures that can be used to recharge the groundwater aquifer such as Valley Dikes, itches/Furrows, Terraces, Loose Stone Walls etc.

The groundwater assets of Balochistan are under gigantic strain because of aimless establishment of tube wells and siphoning. Water table is declining in practically every one of the bowls and in certain bowls the groundwater has practically depleted. In spite of the significance of the groundwater, no appropriate groundwater checking framework exists. Enormous scope counterfeit groundwater re-energize exercises, for example, postpone activity dams have been developed. Notwithstanding, the presentation of these dams has consistently been problematic because of immense sedimentation at the upstream of the dam's body. There is need to take on inventive minimal expense mediations like defective dams, actually take a look at structures and transformed wells alongside watershed the board strategies. In addition, there is need to bring issues to light among the end clients in regards to effective utilization of water.

For sustainable water management, a development Authority ought to be set up to screen and direct groundwater, and execute suitable normal and counterfeit re-energize advancements alongside severe command over exorbitant groundwater usage. Furthermore, broad emergencies

the board projects ought to be dispatched for diminishing the dregs load in the supplies and upgrading the normal re-energize of precipitation. Besides basic fake re-energize innovations like defective dams, infusion wells and re-energizing displays might be advanced at wide scale. The endeavors ought to be made to upgrade the usage of existing postpone activity dams for the genuine motivation behind groundwater re-energize. The latest report of Quetta Water and Sanitation Authority (QWASA), Quetta city required 50 million gallons of water as per day. Ultimately the QWASA are unable to meet the demand of the city. It only provides 30 million gallons of water however it leaves behind 20 million gallon of water on daily basis. Tube wells are installed around 417 in the area of Quetta city, in which 101 of the tube well are not functional. According to QWASA. However there are thousands of illegal tube wells which are not reported in the papers of government due to corrupt and irresponsible government of Balochistan.

Balochistan government adopted some measures to construct dams. 100 dams are in pipelines in which one of the dam namely Mangi dam Located in Ziarat district, which approximately take two or more years to became operational. It will provide 80 million gallon of water to the city on a daily basis. This will give a huge relief to the people of balochistan. In balochistan assembly this recent standing Committee on Planning, Development and Reforms gave a report in which they claim that 22 dams in balochistan have been completed and 26 dams are close to completion. These dams are small in nature and will not accommodate the shortage of water but it will gave a little edge to the Quetta city and its people.

The growth in Balochistan's population and demographic changes like migration and urbanization have increased the demand for water and created a higher need for water services Due to population growth water availability has already reached critical levels / groundwater is usually overexploited increased pollution is degrading the limited resources.

## There are five "driving forces" of change that threaten water sustainability

## Population growth

The first and most important is Population growth (and migration patterns to megacities). According to United Nations projections, the global population will expand from 7. Billion to 9.2 billion by 2050, further diminishing the quantity of water available per person. Further, when millions of people migrate to megacities, it concentrates the demand and stresses local water

supplies, again resulting in less water available per capita.[101] Humans are also increasingly moving to coastal cities where seawater is too saline for drinking and desalinization is too ex- pensive. As we pump freshwater aquifers more fervently to supply water for increasing population growth and urban development, salinity can intrude from the sea and despoil groundwater supplies.

## Environmental change

Environmental change (changing precipitation examples and dry season). Because of our moving environment, dry regions are for the most part becoming dryer and wet regions are becoming wetter from one side of the planet to the other. In parched regions, the somewhat limited quantity of soil dampness dissipates faster under more smoking conditions, bringing about more continuous and significant dry spells. Then again, sticky regions are becoming wetter with additional in-tense precipitation occasions and floods: the hotter sea dissipates more water, and a hotter environment can hold more dampness, expanding mists and supporting worldwide precipitation rates. Too little water and a lot of water are twin juggernauts of environmental change that outcome in water impracticality[102]

## Land-use change (increasing agriculture, irrigation, and urban sprawl)

Land-use change (expanding agribusiness, water system, and never-ending suburbia). Food and water are personally associated. To take care of an extending worldwide populace, we utilize progressively concentrated farming on extended acreages, requiring more substance inputs and further decreasing water quality.[103] Overflow from horticultural land conveys soil particles, manures, and pesticides into streams. Manure supplements, thus, over-improve seaside waters, causing eutrophication, destructive algal sprouts, and hypoxia (low dissolved oxygen), which impedes water quality for people and oceanic biological systems the same.

Urban sprawl — which causes more noteworthy impenetrability, elevates storm water overflow, and forestalls penetration to re-energize springs is contracting groundwater supplies. Groundwater supplies are likewise decreased by the prospering water with drones requested by

[101] Ashraf and Majeed, "Water requirements of major crops of Balochistan*," IUCN Water Programme, Balochistan Programme Office*, (2006): 139.
[102] Ibid.
[103] Kahlown and kemper W.D, "Factors affecting success and failure of trickle irrigation systems in Balochistan," *irrigation science* 1, no.12 (2007): 71-79.

growing populaces and worldwide horticulture. Water system is by a wide margin the biggest water client on the planet. Its effect on springs and waterways is especially intense on the grounds that withdrawals are a "wasteful" utilization of water: the water is generally lost to vanishing. In cases in which water isn't altogether dissipated, horticultural return streams permit some reuse choices, like re-energizing springs through permeation (spreading) lakes.[104] Yet, regularly the return streams are of such low quality (loaded down with salt or harmful leachates) that they are futile for groundwater re-charge.

Energy decisions (power creation, biofuels, and unpredictable extraction of oil and gas). Our energy decisions to fulfill the necessities of developing populaces and improvement are stacked with water repercussions. For instance, electric force creation pulls out more water worldwide than some other use aside from water system. Luckily, the cooling water from electric force plants can be gotten back to the getting stream with less evaporative misfortunes than water system. In any case, if the temperature of the returned water is excessively hot, or then again on the off chance that it contains against consumption synthetic substances or chlorine sanitizer, it might cause injurious consequences for downstream environments and fisheries.

The supposed energy-water nexus explains this strain between developing energy and water resources. It is clear that one can't have water without enormous energy data sources, or energy without critical water impacts. Advancement of new petroleum derivatives (flammable gas, oil, and coal) may affect the nature of immediate surface and groundwater. Some energy advancement choices remove extensively more water than others. "Unusual" oil incorporates oil shales, oil sands, coal-to-fluids, gas-to-fluids, and profound bored sea oil. Regular oil boring and handling utilizes around 8 — 20 lady/MMBTU (gallons of water per million BTu of energy created), while unusual advancement of oil sands utilizes essentially more: 27 — 68 lady/MMBTu as per Chesapeake energy But the biggest water client is inundate corn used to deliver ethanol biofuels, requiring in excess of 2500 lady/MMBTU, or about 200 gallons[105] of "virtual" water needed to create each gallon of ethanol fuel consumed! That is notwithstanding the natural effects of manures, disintegrated soil, and pesticides needed for developing the feedstock .

[104] Majeed and Qureshi, "Balochistan Conservation Strategy: Background Paper," *Balochistan Review* 2, no.7 (2000): 33.
[105] Taher, Bruns and Bamaga, O., Al-Weshali, A. and van Steenbergen, F., 2012. "Local groundwater governance in Yemen: building on traditions and enabling communities to craft new rules," *Hydrogeol* 20, no.6 (October 2012): 117–127

## Unconventional energy

"Unconventional" energy improvement influences water quality to a lot more prominent degree than customary penetrating and handling. A victory of a profound sea well, for example, the BP Macondo Well at the Deep-water Horizon stage in 2o1o, causes an altogether water-quality debacle. Around 200,000,000 gallons of raw petroleum spilled along the Gulf of Mexico coast straightforwardly into a touchy fishery and a considerable the travel industry. Oil sands, another capricious oil asset, expect steam to free bitumen (a tar-like substance), bringing about release lakes of oil tainted water that both are unsafe to untamed life and scars the scene. Profound directional boring and pressure driven cracking for shale oil and gas stores, which expect three to 7,000,000 gallons of water for each well, are then again different strategies.[106] In pressure driven cracking (prominently known as deep earth drilling), drillers infuse exceptionally compressed water, sand, and substance arrangement into shale developments to break the shake and permit flammable gas to stream all the more unreservedly to the surface. The water arrangement, be that as it may, gets back to the surface as stream back and creates water with amazingly high salt fixations and follow toxins (poisonous metals and radionuclides). Typically, such stream back and delivered waters are re-infused into profound wells, far underneath any springs utilized for water supply. Rather than a profound well infusion, some oil and gas organizations are attempting to reuse this water for use in pressure driven cracking at another well.[107] Yet, in case it is left on a superficial level, the stream back and delivered waters from lakes of incredibly low quality water that are hard to treat to a satisfactory norm for release into getting waters. Sadly, some corrupt gas organizations leave these lakes for others to tidy up or for nature to ingest.

## Poverty

Abject Poverty (physical and financial water shortage). Water shortage besets needy individuals more seriously than those with assets to react or adjust. Helpless people group can't relocate to a superior area, pay to import safe drinking water, treat tainted water to satisfy safe drinking guidelines, fix a dry well, or siphon water across huge spans. Volunteer establishments and nongovernmental associations (NGOs) perceive this desperate need and look for

[106] Ibid, 22.
[107] Mustafa and Usman Qazi, 2007. "Transition from Karez to tube well irrigation: development, modernization, and social capitalin Balochistan, Pakistan," *World Dev* 35, no5 (2007): 96–105.

communitarian arrangements. Goal 7 of the United Nations Millennium Development Goals — "Guaranteeing Environmental Sustainability" looks to decrease the extent of individuals without admittance to safe drinking water by half somewhere in the range of 2000 and 2005. For sure, the accomplishment of the protected drinking-water objective is a significant example of overcoming adversity of the UN program. However there stay 800,000,000 individuals on the planet who actually don't have a sufficient water supply; plainly, much work remains.[108] Nor has the connected improvement objective of sufficient sterilization offices (latrines and transport of sewage) for the more than one billion individuals in need been met. The United Nations has taken on a post-2015 advancement plan, with "Water and Sanitation for All" an independent objective. Such an exhaustive worldwide exertion is significant for water manageability.

Each of the five drivers are profoundly interrelated. We can't alleviate environmental change without settling on the energy decisions expected to progress out of the petroleum product age. We should utilize land and energy shrewdly to assist with making occupations and raise individuals out of destitution. We can't take care of water issues identified with never-ending suburbia without checking populace development and relocation to megacities. Also, we can't guarantee clean water for an extending populace without a worldwide social plan that forms solid networks and enables them to address future difficulties.

## Actual water shortage

Balochistan has primarily the issue of actual water shortage. What really is actual water shortage? Actual water shortage is characterized as the absence of accessible water for people and biological systems, ordinarily happening in parched regions, during dry spells, and where water has been over-distributed (causing impractical withdrawals). Monetary water shortage, then again, is the absence of water foundation important to convey water to individuals. Common of ruined networks can't pay to get to water from far off areas or whose water requires huge treatment for drinking. In Rural spaces of Balochistan, it regularly tumbles to ladies and young ladies to find water any place they can, including by venturing out significant distances to gather from wells or streams. Such sources might be tainted, in any case, causing digestive disease, particularly in youngster’s Physical water shortage assumes interest in framework to defeat deficiencies during

[108] Taher, Bruns, Bamaga, Al-Weshali, A. and van Steenbergen, F., “Local groundwater governance in Yemen: building on traditions and enabling communities to craft new rules,” *Hydrogeol. J* 20, no. 6, (2012): 177–188.

seasons of dry spell and in areas with dynamically drier environments. Over assignment of water assets is normal in Balochistan, where horticulture went before different types of advancement and "earlier allotment freedoms" direct that ranchers presently control the water. At the point when surface distributions are devoured during dry seasons, groundwater turns into the sole water supply and is immediately overdrawn.

In this chapter, we have seen that main thrusts of populace development, environmental change, metropolitan and farming spread, energy advancement, and worldwide neediness risk future water supplies and render our current practices impractical. Water impracticality presents hazard for this and people in the future. We ought to adjust to these changing conditions and alleviate them any place and at whatever point we can. Transformation appears as planning for environmental change, making and renovating our water foundation, reusing water, re-energizing springs, settling on savvy energy decisions, and using hyper-effective water system for harvests to take care of the world. Relief requires progressing from the petroleum derivative age and working on human possibilities through demonstrations of worldwide participation, as in the United Nations Sustainable Development Goals. Large numbers of the issues examined thus won't be tackled exclusively through new innovations. Monetary and social issues are vitally connected to the issues of water maintainability. For instance, we won't grasp monetary water shortage still up in the air endeavors, everything being equal, to destroy destitution, further develop instruction, and enable networks.

We are today encountering an inescapable emergency of water unreasonableness all through the world, with impacts at the neighborhood, provincial, and worldwide scales. At the neighborhood scale, the drivers cause significant obstacles for people and families in accessing safe drinking water. At the provincial scale, dry spells and floods are progressively incessant, incurring human wretchedness for an expanding populace, while biological systems experience the ill effects of helpless water quality brought about by our energy and agrarian practices. On a worldwide scale, our endeavors to diminish our ozone-depleting substance discharges have been frustrated by viewing for financial and political interests. It is possible we will come to know the effects of environmental change through the impacts conveyed upon our generally defenseless and moving water assets. Except if we can survive or adjust to these main impetuses, people in the future will acquire a tradition of declining and debased water assets. Our relationship with water

and how we use it can advance to address this difficulty, yet it requires a comprehension of the drivers of unreasonableness and an acknowledgment of great water as basic liberty.

Developmental studies are quite popular these day. Environmental issues play an important role with economic and social development sustainability at economic and social levels, is normally related with environmental issues. Availability of a clean water is the basic requirement of human beings, for domestic as well as industrial purposes. Bulk of people worldwide fail to attain the basic need of clean drinking water, thereby people are met with suffering and tragedy. Massive urbanization, increase in population and the abrupt changing climate are the main reason behind this scarcity. Previously, people tends to focus on traditional and old age methods of managing water resources. But now the dynamics have radically changed and the old age methodologies and techniques fail to deliver.

Moreover, an unavailability of adequate infrastructure and institutions for the day to rate the conditions of the masses. In this regard, Balochistan is not an authentic case rather, it is the prime example of water insecurity. In Pakistan studies literature, there is a quotation which is quite famous that "if Balochistan is properly manage, it can feed whole of Pakistan". However, what is seen is rather opposite of the equation. Problems are natural as well as indigenous, but is it possible to manage those problems or Balochistan should be left as it is. The problems are many and diverse indigenous population is not happy with the policies and the policy makers or other indigenous people are severely antagonistic towards governing sections of the province further more ethnic fault lines are very deep and vast the involvement of non-state actor and foreign agencies furthermore deteriorate the conditions. Development projects are negligible. Even if there are project most of them fail to fulfill the needs of the masses. People are not given the basic needs, which are necessary for the development of the province as well as society

Due to the rugged terrain and harsh environment, a Bedouin and harsh culture is penetrated the Balochistan. However conditions are now going beyond the control of the population. Survival of the masses is at stake. People were already in pain due to these problems, now they are facing the Problem of water scarcity. In case of Balochistan the situation has always been bad, due to massive urbanization coma coupled with ill managed water resources, the situation in in Balochistan is worsened the turmoil and devastation which Balochistan has experienced, now gone far. Severe drought, low precipitation Increase exploitation of Water Resources has resulted in

quick depilation of Water Resources. Already war torn province with so Many fault lines, now experienced the phenomenon of water insecure. Balochistan is experiencing the Problem of migration crisis. Not only has this Water scarcity created lawlessness. Human Development Is hindered due to water scarcity. Moreover in the last couple of decades climate change has been quite abrupt. Unfortunately, Balochistan is not well equipped to counter these radical changes.

The Human Development factor will be the main concern for the Balochistan. The influx of refugees has been a problem of Balochistan for decades. Now, another round of refugees are coming, the impact of these migration will be multifaceted. Primarily there would be three main factors.

- Increase in population which mean further decrease in water resources.
- Massive influx of refugees will again encourage gym culture and lawlessness.
- All these all this toll has to be beer by the masses.

Water insecurity and the ground government policies will in turn wipe out the culture and traditional values of Balochistan. This in turn will create perplexity and frustration the already toned Province will be dragged into another pit. As discussed earlier agenda 2030, clearly states that water scarcity is one of the major problems in the world. In case of Balochistan it is more obvious. Rampant of problems are generated due to water scarcity, ranging from migration crisis to object poverty and lawlessness. The three point agenda is must be curb the problem of water insecurity. discrimination of literature and data extracting new and improved knowledge, developing policies and institutions that can play a formidable role in solving the problem of water scarcity. This three point agenda may set the blueprint to stop the problem of water scarcity. However, complete framework is needed to understand and then rectify the phenomenon of water insecurity.an understanding must be built in such a way that SDGs 6 goal can be achieved, keeping in view the terrain climate and social structure of the Balochistan. Data must be collected at demographical as well as developmental level, so that firstly, the phenomenon is understood vis-a-vis Balochistan. Moreover, one understood all the stakeholders, public and private must coordinate and formulate a plan to solve this problem.

The policymakers need to stand up for this cause before it's too late, if not, treated properly situation may become worse. For the sake of policymaking. Here the list of recommendations.

- Management of resources can be done through an authority which manage and conserves groundwater.
- It must be the on the top priority to investigate the level of groundwater once the amount of groundwater is measured. Innovated methods should be employed for the optimal consumption of groundwater.
- Artificial methods of precipitation along with new methods of generating water resources should be employed.
- Over exploitation of groundwater should be curbed at emergency level.
- Artificial methods such as recharging galleries and upright recharging wells should be installed.
- Aquifers should be increased for the storage along with reservoirs.
- New and efficient method to harvest and store water should be adopted
- Legislation and policies must be formulated thereby curbing the over exploitation of groundwater resources.
- Old age system of karez must be reignited. It has been successful and also an efficient source of water.
- On the basis of policies, framework and plans must be formulated encompassing all the areas regarding sustainable water management.
- Research projects should be sponsored by public and private stakeholders. However, those research result must be employed at the ground level, policy makers should pay heed to these kinds of research projects.

********

# CHAPTER 5

# QUETTA CITY FALLING IN THE ABYSS OF WATER INSECURITY

## Introduction

Water is one of the most important natural source for human survival. Socio-economic stability and upheaval can only be achieved through adequate availability of water. As discussed in the previous chapters, the province of Balochistan has been facing the scourge of water insecurity. In this regard the city of Quetta is eccentric, rather Quetta is one of the largest victim of water insecurity. The city of Quetta is located in North West of Balochistan. It occupies an area of around 2700km2. It consists of serves of valleys and it is surrounded by various mountains namely, Chiltan, Takatoo, Murdar and Zarghoon. Quetta is the capital city of the province of Balochistan. It is the fifth largest city of Pakistan, with average attitude of 1680 meters above sea level. The population of the city is around 2.8 million, which makes it the $6^{th}$ largest city of Pakistan.

Having said that, Quetta is one of the major victim of water insecurity. Due to water scarcity, the social fabric of the society is distorting. Moreover, economic upheaval is hindered and economics of the society fainted to flourish, thereby deteriorating the socio-economic structure of the society. Socio-economic factors determine two major components that are financial stability and social norms and folk ways. But these components are inter related. Sociologists study the relation between economical components and social behavior. Assessment and methodologies are designed to chalk out the relationship between economics and behavior of the society. In this regard the case study of Quetta is quite relevant vis-a-vis socio-economic factor and water scarcity nexus.

It is a very pertinent question to address, that what are the main reasons behind the problem of water insecurity in the city of Quetta. The reason can be Primordial in nature, the reason may be socially constructed. Moreover they may be economical in nature. If all these factors are not thoroughly and deeply studied, one may fail to identify the real reason behind the problem of water scarcity Quetta, being the center of political activities coupled with problems such as insecurity

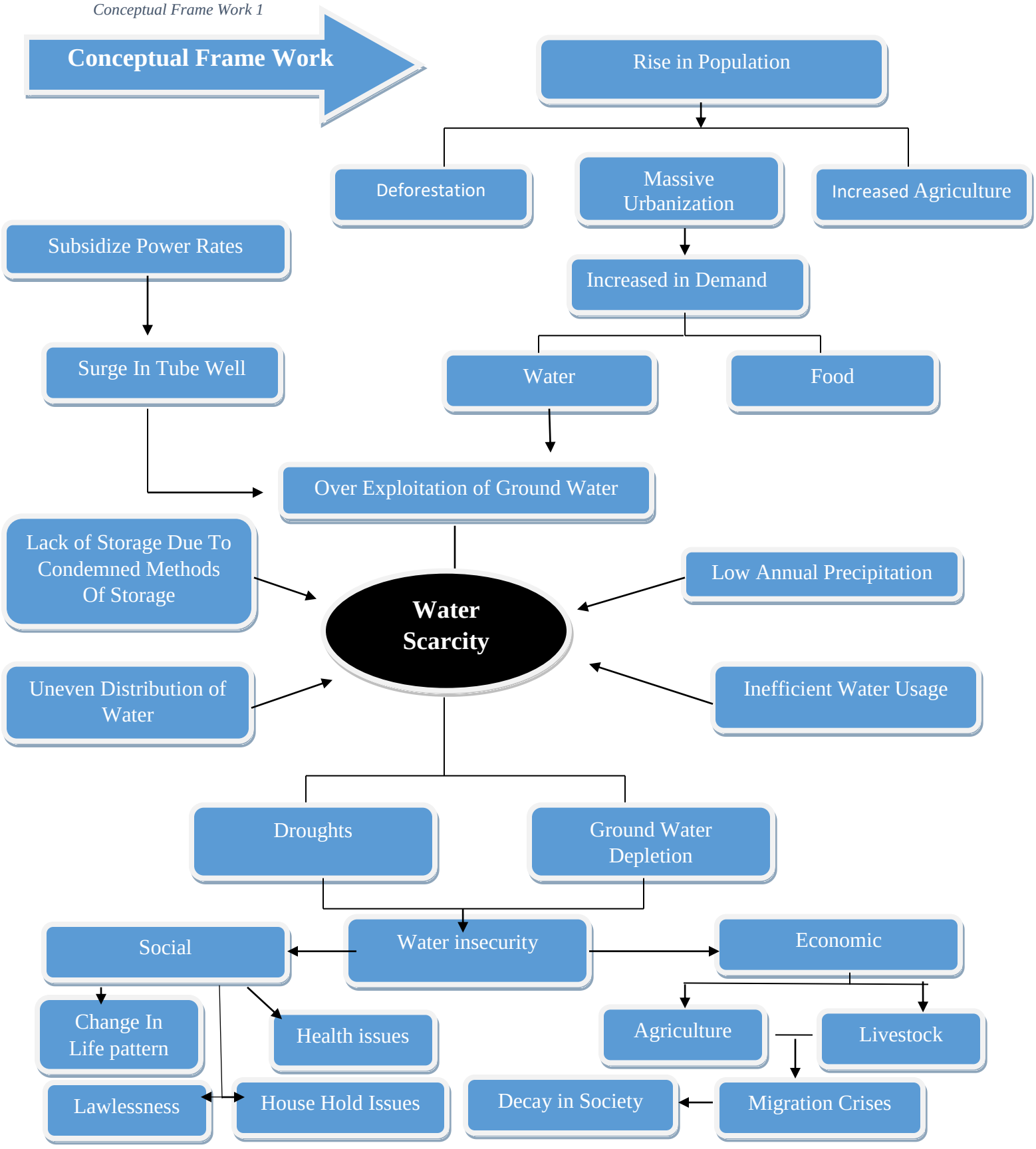
and terrorism, is a fragile zone. If the casual relationship between socio-economic factors and water scarcity is not properly established, the situation may worsen and possible solutions to the problem may not be achieved.

Therefore, one has to look into the phenomenon like population growth. The relationship is proportional between population growth and water scarcity. But one must make an attempt to formulate a transparent and clear form of study which can answer whether the relationship is direct or inverse. Moreover, massive urbanization can also lead to decrease water resources. Furthermore, massive urbanization and population growth may results on other phenomena, which can also influence water scarcity. Directly or indirectly. These activities may be primordial or even the result of increased agriculture, infrastructure and technology. However, the fact remains as is that his abrupt and septal decrease in ground water table.

Notwithstanding, these remarks, the relationship between water scarcity and social economic factors can be further extrapolated. Previously discussed was the impact of socio economic factors on water scarcity, whereas now another methodology should be constructed to understand the impact of water scarcity on socio-economic behaviour. For instance, water scarcity can create migration crisis Moreover, the static life patterns and social behaviour may change abruptly due to water scarcity, livestock and agriculture may suffered dramatically. Not only that, water scarcity may further deteriorate and then convert into water insecurity. The Geo-strategic location of Quetta coupled with the fringe factors, the situation may worsen. Water insecurity may result in exponential rise of terrorism and extremism, lawlessness may increase Multi times, because water scarcity has direct impact on the economic structure, economical structure. It may create severe social stratification in the society, thereby creating social anxiety and lawlessness. The situation. Quetta is experiencing has many casual factors. However, one of the main reason behind the problems of Quetta is abrupt Change at socio-economic level, which is the direct by-product of water security.

Ill managed water resources have caused a great deal of problems for the people of quite district. The survey conducted on the basis of primary and secondary data was helpful in identifying the following factors responsible for water shortage and furthermore, showing its impacts.

*Conceptual Frame Work 1*



## Rise in Population

Exponential rise in the growth of population in the Quetta district show that water supply is decreasing at alarming level.[109] Overpopulation will ultimately results in overconsumption and over exploitation of water resources. Moreover, Ill management also play its part according to a study, the increase in the growth rate of population in Quetta is 3% to 6% per year.[110] Due to poverty and lack of employment in the ruler area. People tend to migrate towards the urban centres like Quetta. This rapid influx of population coupled with seasonal visitors especially in summer help burdening effect on the fragile groundwater resources. Due to water insecurity people of Quetta embraced Land selling. And it has become a common practice in rural Balochistan. This business mainly took root with the droughts of tube wells. The land is sold in particular to outsiders. The afghan refugees were the biggest buyers of land as they were rich and had wealth in Afghanistan or had earned while working in Gulf and Middle East. This practice had brought end to the tradition of selling the lands to the local neighbors rather than selling them to outsiders. The large scale farmers and landlords have made use of their lands by constructing shops by the side of the road and renting them. The construction of colonies is another way of earning.

The cost of land has increased drastically due to the requirement and construction of housing societies. In Quetta, the number of shops have increased significantly whereas agriculture has become a less likely business. This was due to lack of water and crops stealing. Quetta district was considered the hub of apple cultivation but due to lack of agriculture in the region the premier position is taken over by many other areas.

## Increased agriculture

Some policies generated by the government subsidized electricity was provided to the farmers. Due to this, there was an increase in the cultivation of the crops like Apple. Moreover, Apple crops became the cash crop, as the income generated through Apple crop was greater than other crops. Apple crops requires more water than other crops like grapes, pomegranates, etc.[111] Multiple studies show that the area where cash

[109] Mustafa and Usman Qazi, 2007. "Transition from Karez to tube well irrigation: development, modernization, and social capital in Balochistan, Pakistan," World Dev 35, no5 (2007): 96–105.
[110] Nasurullah K, Ahmad M, Malghani MGK, Kakar E, "Socio-economic effect of water scarcity in tehsil karezat district Pishin Balochistan,: *Journal of Applied & emerging Science* 2, no. 2 (February 2011): 78-81
[111] Government of Balochistan, Agriculture Extension.

crops have increased main folds experience severe water scarcity.[112] Similarly a competitive study was conducted on the crops of sunflowers and onions. [113] This study clearly portrays that one of the major source of the water scarcity is the increased growth in cash crops. During the survey conducted the individual were asked about the data vis-à-vis cropping pattern. The results are recorded in figure 1.

*Figure 1*

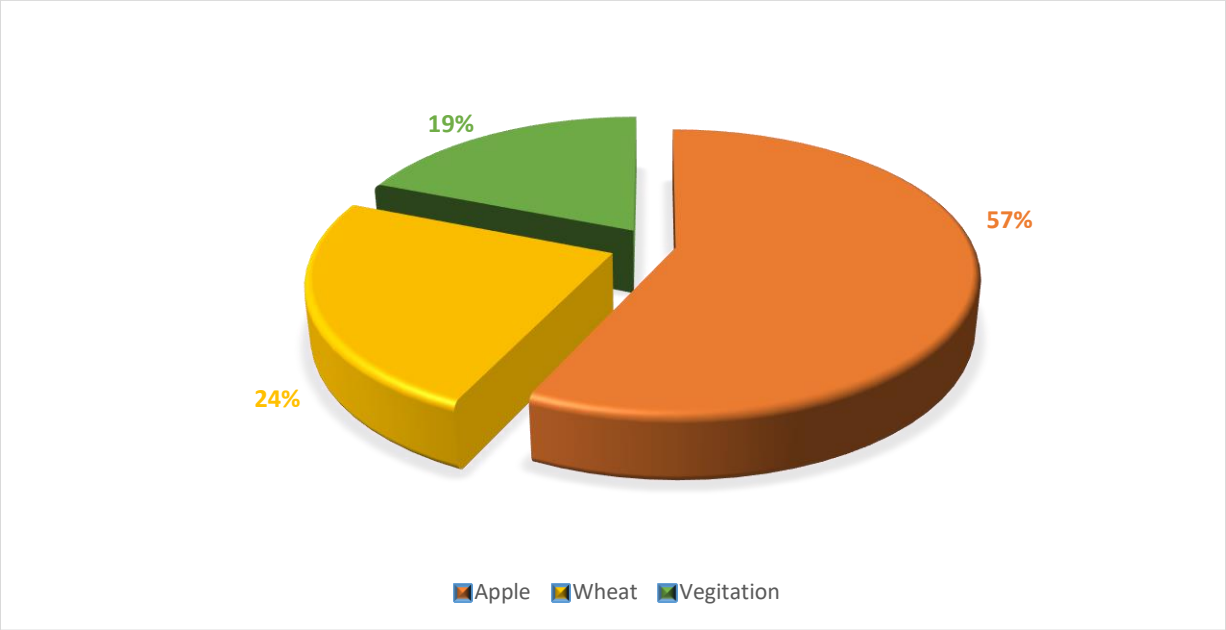



Figure 1 shows the data of the cropping patterns as collected by different individual of irrigation department and some farmers as it can be seen that 57% of the area is used for orchards, especially apple crops 19% of the area for vegetation and from the total 24% area was cultivated for wheat. More than the half of the agriculture land was cultivated for the apple production that cause the more consumption of water is inevitable.

## Subsidized power rates

It was decided that the agriculture sector in Balochistan will pay less tariffs on electricity the farmer has to pay a minimal amount of Rs 6000/. Where the rest of the amount will be paid by

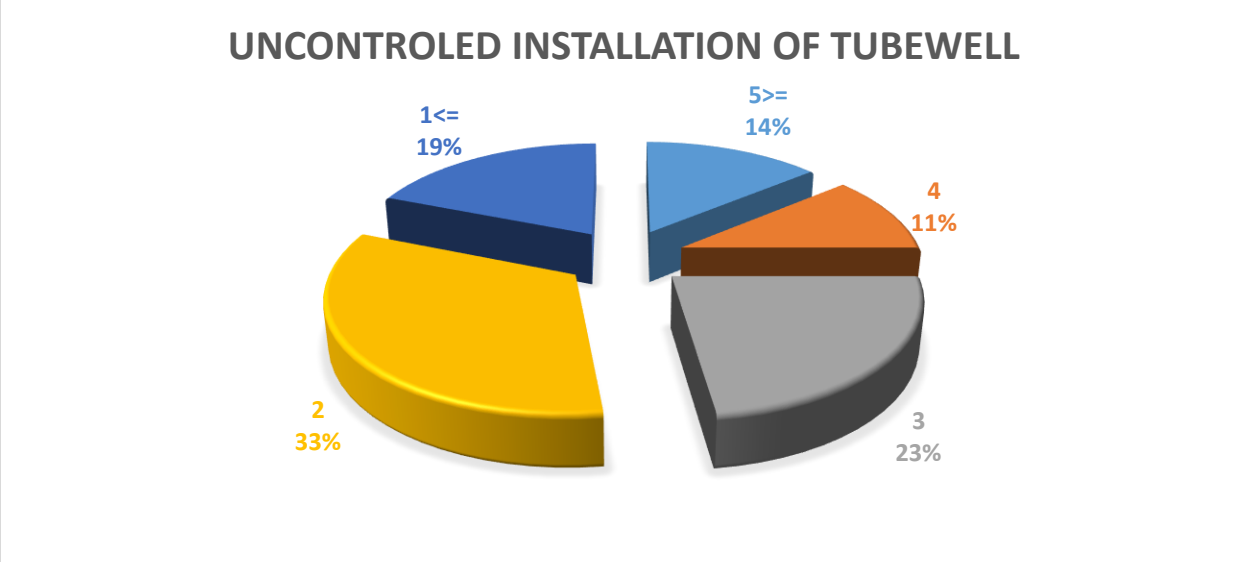
[112] Zainuddin Kakar and Syed Munawar Shah, "Agricultural Productivity Water Scarcity in Pishin Lora Basin of Balochistan," *International Journal of Scientific & Engineering Research 9*, Issue 11 (November 2018): 89-105.
[113] MA Chaudhary, AS Lodhi, M Ahmad, "Comparative study of the cost of production and decision making: Analysis in case of onion and sunflower crops in Quetta district," *Sarhad Journal of Agriculture* 24, no.3 (2008): 469-478.

federal government, provincial government and water and power development authority (WAPDA).[114] These subsidized rates created a compound effect and farmers was able to install deep tube wells. Previously, these tube wells are diesel engine operated. But after the subsidy, all of the tube wells are converted to electricity. Moreover, subsidized rates created a surge in the installation of tube wells. This in turn resulted in over exploitation of groundwater resources. This indiscriminate development of deep tube wells has resulted in an abrupt decline in the water table.

## Uncontrolled installation of tube wells

The subsidized electricity rates encourage people to indiscriminate development of deep tube wells, which are one of the major cause of water scarcity. People never looked for other forms of irrigation system. Digging tube wells seem to be only possible solution for the irrigation of crops.[115] while conducting the survey, one of the major reasons of water scarcity was the over abstraction of Water Resources and the rise on the number of tube wells when several farmers were interviewed, it was found the major of the farmers were using more than one tube wells for the irrigation of their respective crops. The response are recorded in figure 2.

*Figure 2*




[114]Zainuddin Kakar, Syed Munawar Shah and Maqsood Ahmad Khan, "Scarcity of water resources in rural area of Quetta District; challenges and preparedness," *IOP Conf. Series: Materials Science and Engineering* 2,no.3 (2018): 33, doi:10.1088/1757-899X/414/1/012013

[115] M A Nasurullah, M Ahmad, Malghani and E Kakar, "Socio-Economic Effect of Water Scarcity in Tehsil Karezat District Pishin Balochistan," *Journal of Applied & Emerging Science* 2, No. 2 (2011) 116-123.

Figure 2 showed the response about the members of tube wells. Surprisingly 14% of the farmers are installing five or more in their lands, 11% mentioned that their lands are irrigated through four tube wells. Moreover, 23% are those who have three tube wells installed. 33% are those who have two while the remaining 19% have one. The above data clearly indicates that indiscriminate installation of tube wells thereby resulting in severe water scarcity. Not only this, but farmers are leaving no space for the rise of water table. When the survey was conducted, it was quite shocking to see the motors used for running table tube wells. As shown in figure 3

*Figure 3*

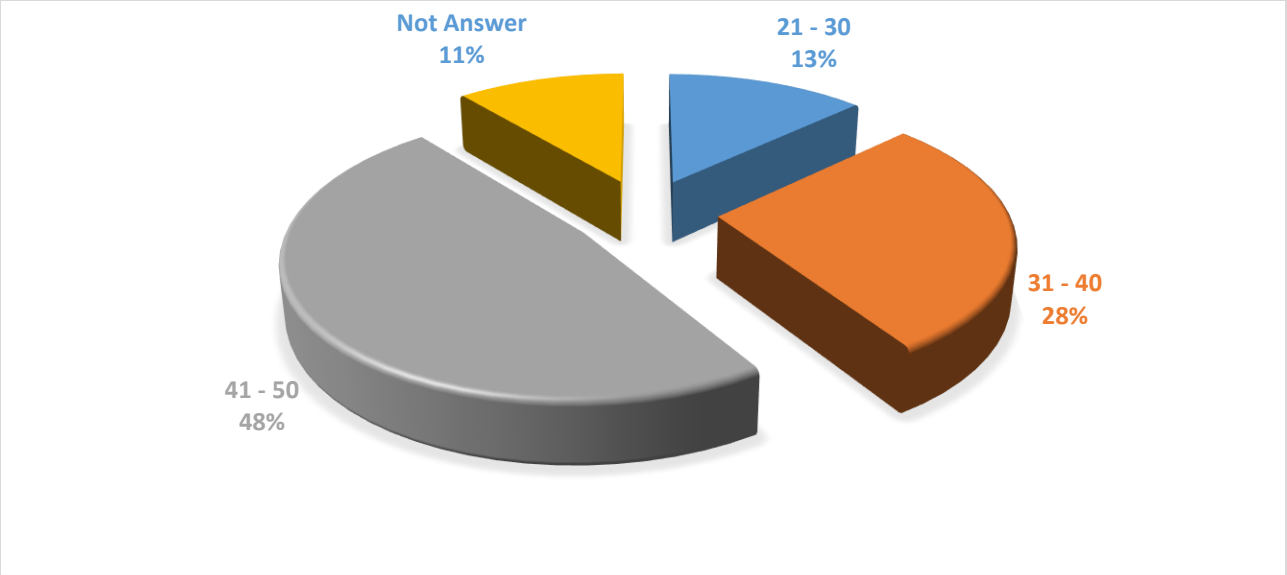



Figure 3 shows the data portraying the intense in horsepower (HP) of the motors used for running the tube wells. The above data clearly indicates that majority of the farmers are using high power motors for the running of tube wells around 48% are those who are running 41 to 50 HP motors, while 28% mentioned that 31 to 40 HP motors were used 13% are those using 21 to 30 HP motors. The data clearly indicates that 89% are using high engine horsepower motors thereby causing water scarcity in Quetta city.

## Violation of tube well spacing norms

Balochistan groundwater administration issued an ordinance in 1978 in which certain guidelines regarding the spacing of two Wells was given in a clause.[116] While conducting the survey violation were clearly seen. Most of the farmer paid no heed to spacing norms. For example, around 750 feet therefore the depletion of Water Resources increased manifolds.

*Figure 4*

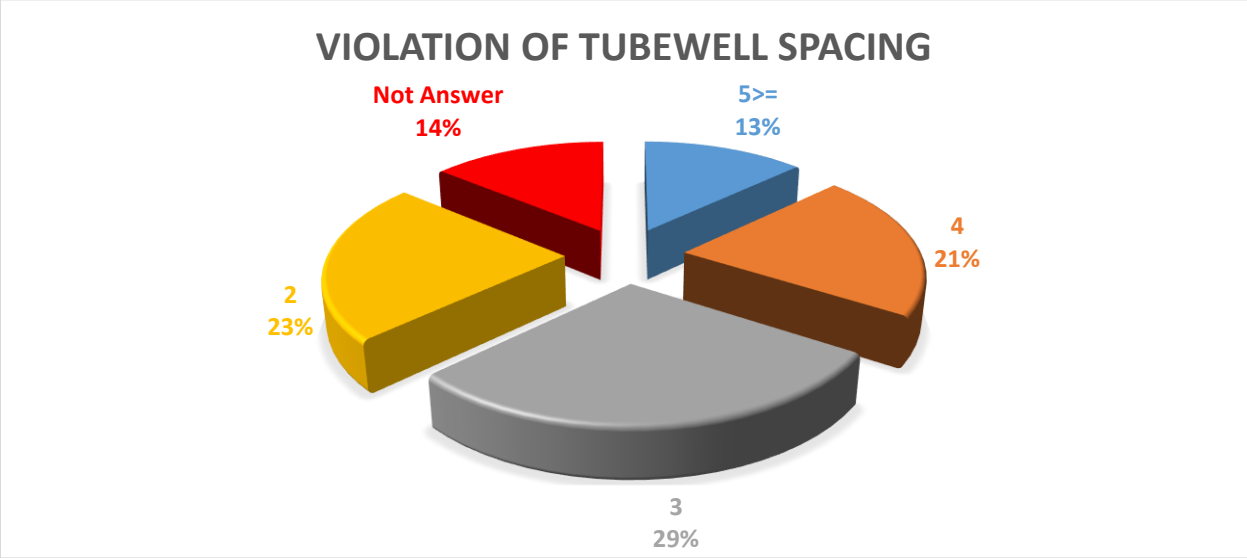



Figure 4 shows that the participant who replied that there are more than five tube wells within every 1000 feet square are 13% , 21% are those who said that there are four tube wells within every 1000 feet square, 29% said that three, where 23% mentioned two. So one can conclude that no regulatory by government administration is also one of the reason.

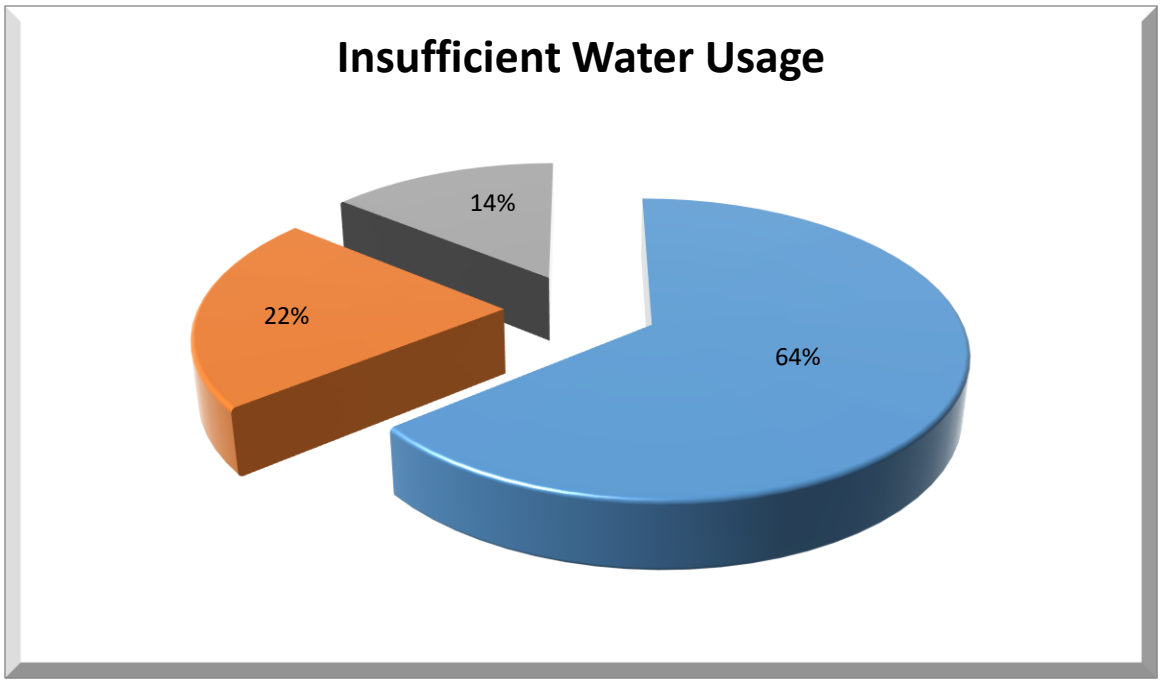
## Inefficient water usage.

The old age irrigation system proved to be very useful in Quetta district, but massive urbanization and deforestation caused the condemnation of old age system. While conducting the survey it was seen that most of the respondent did not have the required knowledge about innovative method of irrigation. Farmers lack the very basic knowledge and education about the efficient use of water. Some of the studies concluded that one of the major reasons behind water

[116] D Mustafa and M U Qazi, "Transition from karezet to tube wells irrigation: development, Modernization and social capital in Balochistan Pakistan," World Development 35. No.10 (2007): 17-81.

scarcity is the inefficient use of water.[117] Figure 5 shows the response of the individual about the information of efficient and modern irrigation system.

*Figure 5*




The above data show that 64% of the people think that innovative and more effective system of irrigation has no impact on the overall yield of the crops, Furthermore they also think that it do not conserve water resources.22% consider it effective and 14% not answered. More than half of the population is of the opinion that efficient water management do not conserve water resources, hence lack of knowledge and mismanagement lead to water scarcity.

## Poor drought management

The province of Balochistan has been experiencing several droughts for many years. Low precipitation with severe climate conditions coupled with a rugged terrain. The year 1998 to 2006 or the era of severe drought.[118] Quetta district received negligible rainfall during that time. The recharge in the rivers decline unreachably due to low rain fall, water table declined alarmingly.

[117] SM Khair, S Mushtaq, R Culas and M Hafeez, "Groundwater markets under the water scarcity conditions in upland Balochistan, Pakistan," *Agricultural Systems* 107, 1 (2012): 21-32.
[118] AS Qureshi, M Akhter, "Analysis of Drought Coping Strategies in Balochistan and Sindh Province of Pakistan," *International Water Management Institute* 7, n0.5 (2004):86.

There were many Cardinal impacts of drought. People started digging unprecedented and indiscriminate amount of tube wells, extraction of water increased, manifolds. This is turn further deteriorated the existing low water table. Moreover, due to low precipitation, the annual recharge of the groundwater became acute and almost reached the lowest level. Several studies were conducting in which the domain was Quetta district. These studies concluded that gradient was step and downwards in Quetta district as it declined around 18 to 24 meter per year.[119] The cultivation of crops, fruits and vegetation fell radically. There was a decline of around 33% of the total production.[120]

## Impact of water scarcity

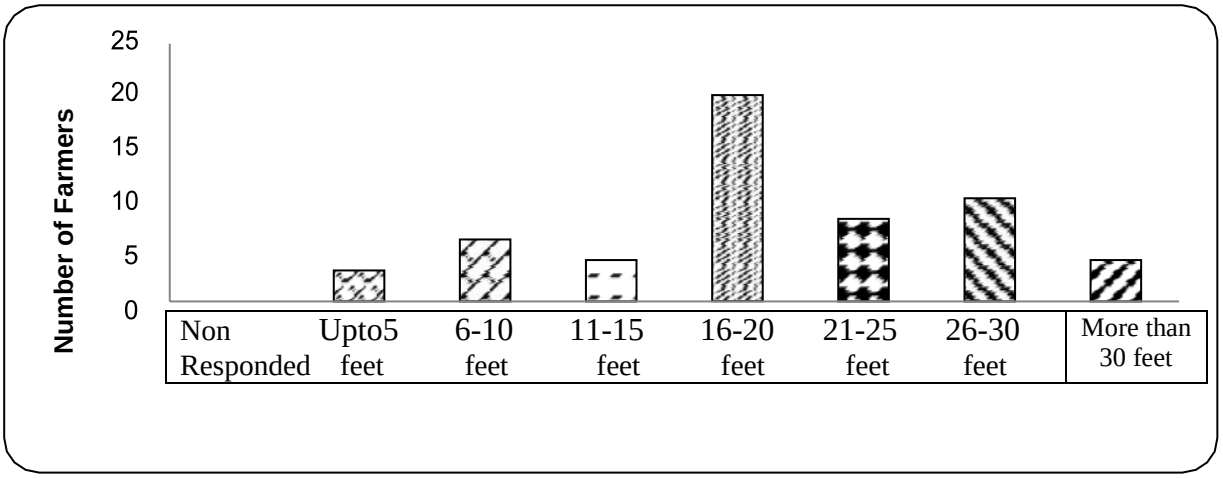
After conducting the survey, there were some ground breaking developments, which were revealed under the umbrella of water scarcity. To sum it up, one can say that water scarcity cause water insecurity, which has both social as well as economic repercussion on the society.

## Falling Groundwater table

The relationship between water scarcity and decline in groundwater table is directly proportional. As mentioned earlier, that the decline in groundwater table in Quetta city was around 18 to 24 feet per year.[121] Similarly, the region adjacent to Quetta city such as Pishin, Kuchlagh also experienced declining water table at 4 to 5 meters annually [122]the data collected from different offices was a was quite shocking. During the past 30 years. Quetta city saw the declining water table for 200 to 700 feet. It has a bipolar effect on the area. Firstly, the cost of pumping the water through tubules increased many times. Moreover, the quality of water is also deteriorating due to excessive abstraction.[123] A survey conducted on ground water depletion of Quetta city from the farmers is a prime example of water fall. As shown in the figure 6.

[119] M A Nasurullah, M Ahmad, M A K Malghani and E Kakar, "Socio-Economic Effect of Water Scarcity in Tehsil Karezat District Pishin Balochistan," *Journal of Applied & Emerging Science* 2, No. 2 (2011): 116-123.
[120] T Walter, J Kloos and D Tsegai, "Improving Water use Efficiency under Worsening Scarcity: Evidence from the Middle Olifants Sub-basin in South Africa," *Water SA* 37, No. 3 (2011): 57-70.
[121] Y Yin, Q Tang, X Liu and Zhang X, "Water scarcity under various socio-economic pathways and its potential effects on food production in the Yellow River basin," *Hydrol. Earth Syst. Sci* 21, no.3 (2020): 791-804.
[122]As, M," Analysis of Drought," 101.
[123] SM Khair, RJ Culas, M Hafeez, "The Causes of Groundwater decline in Upland of Balochistan Region Pakistan: Implication of Water Management Policies," *Paper Presented at the 39th Australian Conference of Economists* September, 2010: 27-29.

*Figure 6*




The above graph shows that the depletion of groundwater level in Quetta city. In which the data shows that majority of the individual mentioned that water is declining by 20 feet annually for example 20 out of 55 farmers Agreed that it is declining from 16 to 20 feet annual. Likewise, 10 farmers say that ground water is lessening from 26 to 30 feet yearly, 8 farmers point out that 21 to 25 feet once in a year. More over 4 farmers mention that the depletion of water is greater than 30 feet per year. 6 farmers mark that it is declining from 6 to 10 feet. Similarly, the remaining data also show that there is a decline in the groundwater table annually.

## Water insecurity

Water scarcity has some explicit as well as implicit impacts. Explicitly or directly looking, one can see that water scarcity causes droughts and groundwater depletion. This in turns result in water insecurity, water insecurity in turns result in social and economic problems. Their problems can be violent or non-violent which ultimately cause severe conflicts at community as well as structural level.

## Loss in agriculture and livestock

It is discussed earlier that water scarcity results in severe decline of agriculture and livestock. Different survey and studies suggests that there was a severe decline in the cultivation

of crops for 30 years. Agriculture declined by 33% in Quetta city.[124] Secondly, livestock also declined in the peripheral region of Quetta city. Figure 7 and figure 8 shows the data collected from different official and inhabitants

*Figure 7*

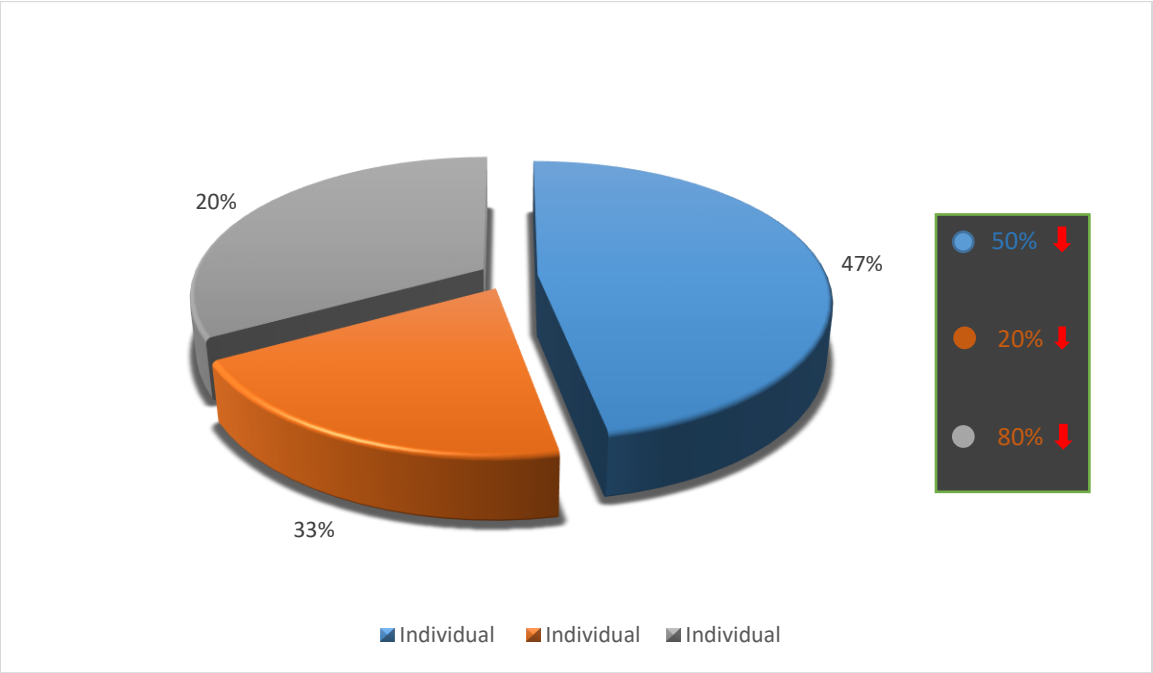
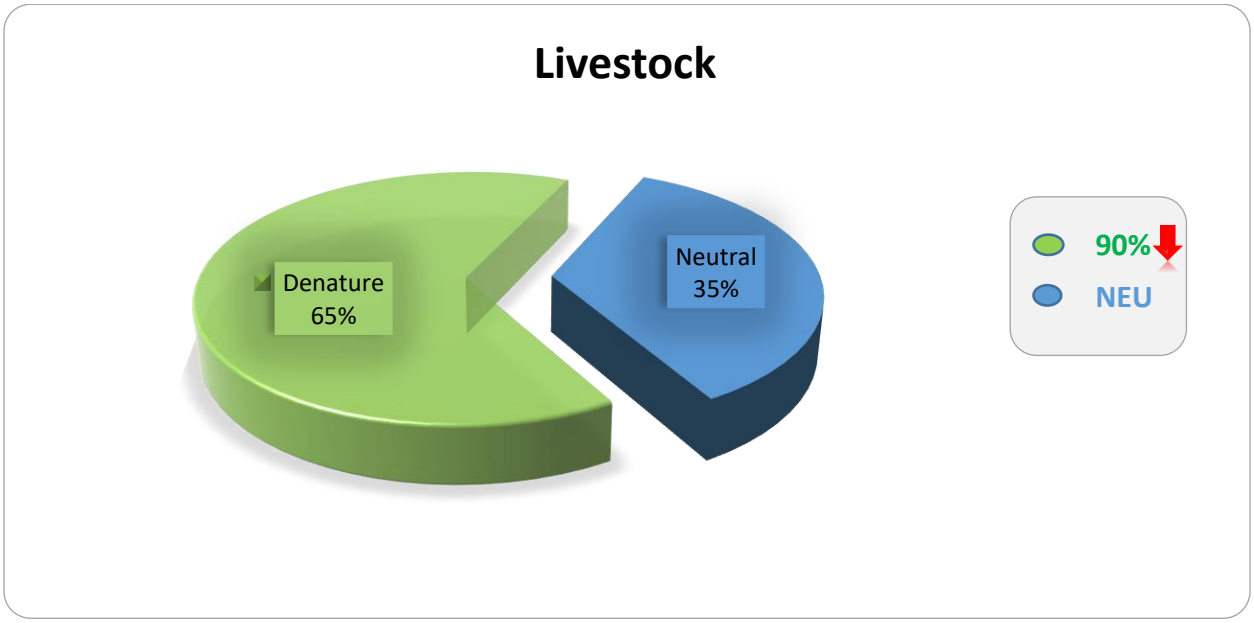



Figure 8 shows that 47% of the individual mentioned that agriculture decreased by 50% more or 33% are of the opinion that more than 20% of the agriculture has decreased in the last decade, and 20% are claiming that, it is decreased up to 80%. Thereby forcing people to migrate.

[124] Government of Balochistan, "Agriculture statistics of Balochistan," *Department of Agriculture Extension, Balochistan, Pakistan*, 2010.

*Figure 8*




This survey was mainly conducted on the indigenous inhabitants as shown in figure nine. Surprisingly, it was seen that more than 65% people think that livestock has denatured by 90% in the last decade. And 35% individuals are neutral.

## Migration crisis

Water insecurity decay of livestock and decrease in agriculture has compelled the masses to migrate in chunks. This widespread migration has converted the settler into refugees.[125] It has manifold effects on the societal structure. People are facing identity crises Moreover, local population failed to acknowledge the migrators. Therefore people are in a rift in the society. burdening economy create perplexity and frustration thereby giving rise to fringe elements and lawlessness during the survey large individual claim that decrease in water resources and unemployment forced many families to migrate towards the area which are abundant in water and employment. This type of migration further deteriorated the situation. As the situation worsened

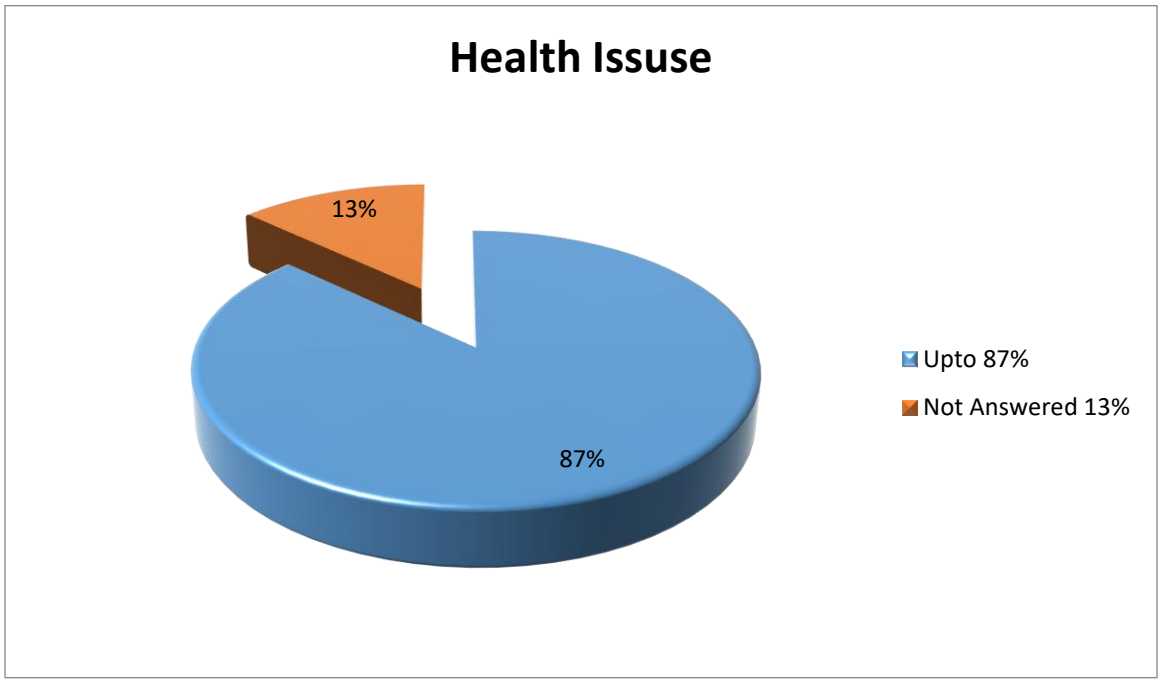
[125] United Nations, High Commissioner for Refugees, Refugee Affected and Hosting Areas (RAHA). Refugee Affected and Hosting Areas (RAHA) Impact Assessment 2009 – 2016. New York, NY: UN Headquarters, 2016.

due to competition in the local market. This has created a rift between local population and the migrants sometimes called as refugees.

## Impact on health situations

Water scarcity has adversely effect on human health. Due to water scarcity and bad sanitation, Human Health is in poor state. The most common diseases which are seen and are directly related to water scarcity. Are vomiting, diarrhea, and fewer, especially among children? Due to poverty. Many farmers indicated that they fail to pay for the basic needs such as health, food, water, etc.

*Figure 9*




During the survey 87% of inhabitants revealed that health issues have increased exponentially in the last decade.

## Lawlessness

Some mafias related to water resources have effected supply chain of water quite drastically. They include tanker mafia and low level farmers, who actually own tube wells for irrigation purposes but on the other hand they sell the water for everyday use of the urban population. Proper tax is never paid for such a business or simply this illegal activity because of

the subsidies given by the government, especially by the department of WAPDA and Irrigation.[126] This is breaking point of water related corruption. On the other hand, the farmers and tube well owner do justify their use of water resources by some small scale farming. Now a days, a farmer earn more money by selling water rather than using it for crop growth, which is quite a difficult business. Private tanker companies buy water from small land owners on quite low rates i.e. 500-550 per filling of one tanker and sell that water to urban areas for around 1500 to 2200 per tanker[127]. Though, the cost of transportation of water do effects the prices but still the rates are competitively higher to the buying cost and the profit is quite high. During summer, the requirement of water increases as it is used for livestock and garden farming but during winter the water requirements are cut by half because of the less consumption of water. A tube well is generally used for selling 160 tankers of water per day, during summer. Whereas the numbers come down 80 during winter season.[128] Although the numbers come down dramatically but they do not have any effect on costs of electricity, that is just because of the subsidized connections.

In this chapter, a survey was conducted, in which respondents provided with the valuable data vis-à-vis water scarcity. Certain factors resulted in water scarcity and water scarcity created water insecurity, which in turn creates social and economic problems. Rising population increase in agriculture, especially cash crops, low precipitation and indiscriminate installations of tube wells, expansion of cities or massive urbanization resulted in water scarcity. Which resulted in migration crisis and leads towards severe socially and economic rifts in the society, especially urban centers like Quetta. This rift resulted in problems like lawlessness, terrorism, communal riots and other domestic problems. To curb these problems reverse Engineering is needed. A government and private stakeholders should have to formulate policies and framework to undone this phenomena by simply adopting methods of efficient use of resources. Such as spread awareness in masses regarding population control and its inverse effect on the society, by using tools like social media internet or full funded campaign at governmental level to mobilized the inhabitants. Efficient use of methods and materials should be used. Water-demand management is fundamental because of the enlarged demand for water for agriculture. Dams and power generated projects are required to overcome the issue of insufficient water for the agriculture. New methods

[126] Kakar,"Scarcity of water,"208

[127] M A,"Socio-Economic Effect,"120-121.

[128] Ibid, 122.

of agriculture should be adopted such as Subsurface Drip Irrigation (SDI) and treated wastewater (TWW) for drip irrigation. Tunnel irrigation for vegetables. The Government should put restriction on establishment of new tube wells in the city. Expanding the proficient utilization of water and treated wastewater and advancing water recycling. Restructure pricing in the water department and gave incentives to the Farmers. And also gave education and advance technology and high quality seeds and plants for excessive production. Enactment and strategies should be formulated to control the over exploitation of groundwater assets. And it is suggested that the high-effectiveness water system should be introduced for overcoming the issue of ground water shortage. System of karez should be reignited. It has been fruitful and furthermore an effective source of water. Policies, structure and plans should be formed to overcome the issues of migration crisis which leads to communal riots and other domestic hitches.

# CONCLUSION

The study tries to explore basic fundamentals of sustainable development and its relation with water security. Agenda 2030 of SDGs calls for erudition of poverty and hunger. Goal 6 of agenda 2030, calls for clean water and sanitation. The main target that must be achieved is the availability and affordability of clean water. Agenda 2030 further retrieve that there are four major concerns regarding water, these are clean drinking water; sanitation and hygiene; water resources and water quality. It ensures sustainable management of water and sanitation for all. It establishes link between water insecurity and sustainable development.

Water insecurity is a major issue that consistently rises and has proved quite hazardous during economic development. We know that without water life is impossible. In SDG 6, the importance of water has already been briefly discussed. We know that for the elimination of hunger, poverty and economic disability, the main source that would be used is water. Water management and use of water resources play an important role in completion and implementing all the SDGs. Water related crises are needed to be dealt with in a swift manner in order to gain what is required. Proper water management is required, which may not give unlimited access to water for all. But, it will definitely help in increasing the number of water reservoir and fighting the water crisis. Water crises is one of the major issues of the world and always stands on top of the table.

Water scarcity may seems to be a small problem by many. This idea is superficial and shallow intrinsically. A deep look into the phenomenon reveal surprising facts, which are shocking and quite alarming. This study is conducted in a peculiar way, focusing on the phenomenon of sustainable development goals and water insecurity. An inductive methodology revealed that water scarcity ultimately results in water insecurity. Water insecurity results in social and economic problems that will ultimately result in chaos and violence. Moreover, the phenomenon on SDGs goal 6 calls for the balance between resources and its consumption. If this balance is not maintained, it can lead to droughts, depletion of resources, ecological degradation, which will ultimately result in the decay of society.

Malthusian theory was applied to understand this phenomenon. By applying this theory and analyzing the data collected at secondary level, the results were obtained and recorded in

chapters 3 and 4. It is recorded that surge in the population, massive urbanization and other economic factors lead to the exponential decrease of resources, which results in the exponential rise of social and economic problems. SDGs clearly indicate that water scarcity will ultimately results in water insecurity. Moreover, under theoretical framework, it is understood that depletion of resources and increase in population is exponential, whereas increase in natural resources and management of resources in linear or static. Over consumption and over depletion of resources lead to environmental degradation, ecological collapse, migration crisis and loss in agriculture. These factors result in loss of social fabrics, unemployment, and deepening of the fringe elements.

When it comes to Balochistan, the situation is more drastic and problematic. The rugged terrain and the menace of terrorism is prevalent in Balochistan. These problems further disturb the social fabric of the society. The last chapter proves to be very vital in understanding the problem of water scarcity. It is based on Quetta city. A detailed survey was conducted based on a questionnaire, with closed ended questions and interviews. Fortunately, results were in quite synchrony with the previous chapters. The data indicates that water scarcity is directly proportional to water insecurity, which ultimately results in social and economic problems.

It is almost undeniable that causes and impacts of water scarcity are enormous. The way increase in population results in the decline of water table and biodiversity is quite pertinent. Moreover, massive urbanization has multipolar problems. There have been many institutions that encourage the conservation of agriculture and forests, but the urban culture is so rampant that all the efforts go in vain. It is very unfortunate to confess that Pakistan's forest land is only 3% of its total land and that too is decreasing. Instead of sustainability and sustainable projects, efforts are taken in the wrong direction thereby huge constructions at the cost of degrading environment and disturbing the ecosystem. Also, leaving no room for the conservation of water resources rather resulting in further exploiting the already low water level.

Ecological degradation, water insecurity, and its impact are so huge that if not taken seriously it can lead to serious crisis. The role of the institutions and officials at high level must be formidable. One can also argue that the resources are always low due to increase in population and other problems, however it must be kept in mind that if sustainable development protocols are followed, the results maybe brilliant. The example of Bhutan is very relevant in this regard. Pakistan has to follow the pattern and framework opted by countries which have been successful

in dealing the problems such as water insecurity. Moreover, public and private stakeholders have to understand the magnanimity of this problem. They must pay heed to this problem and must be able to derive the methodology and framework regarding this problem.

Furthermore, it is also mentioned in the study that how SDGs can play a pivotal role in curbing the problem of water insecurity. It is concluded that there is a need of reverse engineering while slowing the problem of water insecurity. Moreover, a set of several remedies or recommendation are also submitted to hinder or stop or even divert the problem of water insecurity, especially in the case of Quetta city. Keeping in mind the local population and culture, remedies are given in such a way which can incorporate all the public and private stakeholders.

If these steps are not taken or policies are not formulated by the institutions based on the data, Quetta district may fall in the pit of water insecurity keeping in mind the previously deteriorated condition of Quetta, this problem will make violence and chaos ramped. One has to understand that this part of Pakistan is marginalized, severely terrorized and radicalized. People are unable to make ends and are in so much pain. Water scarcity will further increase these problems, fringe elements will increase further wave of social crisis and economic disability. Water insecurity will exert pressure in the peripheral areas of the Quetta, which will in turn exert pressure on Quetta which is already in a stage of distress, multi-ethnicity, migration crises. These factors will lead to social and economic decline. If these trends keep on increasing, Quetta city might fall in the abyss of Malthusian crisis.

********

# BIBLIOGRAPHY

Ahmed, S., (2007). Persistent Drought of Balochistan and Impacts of Water Availability and Agriculture. Water for Balochistan Policy Briefings. Vol. (3) No.6. 1-7

Ashraf, M., Routray, J.K., (2013). Perception and understanding of drought and coping strategies of farming households in north-west Balochistan. International Journal of Disaster Risk Reduction. (5). 49-60

Ahmed, K., Shahid, S., Sobri, H., Wang, X., (2016). Characterization of Seasonal Droughts in Balochistan Province, Pakistan. Stochastic Environmental Research and Risk Assessment. 30 (2).

Ahmed, S., Hussain, Z., Qureshi, A.S., Majeed, R., Saleem, M., (2004). Drought Mitigation in Pakistan: Current Status and Options for Future Strategies, Working paper No 85, International Water Management Institute, 1-7

Ahmed, S., (2007). Persistent Drought of Balochistan and Impacts of Water Availability and Agriculture. Water for Balochistan Policy Briefings. Vol. (3) No.6. 1-7

Ashraf, M., Routray, J.K., (2013). Perception and understanding of drought and coping strategies of farming households in north-west Balochistan. International Journal of Disaster Risk Reduction. (5). 49-60

Bhavnani, R., Vordzorgbe, S., Owor, M., Bousquet, F., (2008). Report on the Status of Disaster Risk Reduction in the Sub-Saharan Africa Region. Commission of the African Union, United Nations and the World Bank. Retrieved from: (http:// www.unisdr.org/files/2229DRRinSubSaharan AfricaRegion.pdf⟩ (date accessed 17.12.15.)

Bourque, L. B., Siegel J. M., Kano, M. and Wood M.M., (2006). Morbidity and mortality associated with disasters. In: Rodríguez, H., Quarantelli, E.L., Dynes, R. R., Handbook of Disaster Research. New York: Springer, 97–112.

Bhavnani, R., Vordzorgbe, S., Owor, M., Bousquet, F., (2008). Report on the Status of Disaster Risk Reduction in the Sub-Saharan Africa Region. Commission of the African Union, United Nations and the World Bank. Retrieved from: (http:// www.unisdr.org/files/2229DRRinSubSaharan AfricaRegion.pdf⟩ (date accessed 17.12.15.)

Boken, V. K., Cracknell, A. P., and Heathcote, R. L., (2004). Monitoring and Predicting Agricultural Drought. Cary, US: Oxford University Press (United States of America),.3-4

Bourque, L. B., Siegel J. M., Kano, M. and Wood M.M., (2006). Morbidity and mortality associated with disasters. In: Rodríguez, H., Quarantelli, E.L., Dynes, R. R., Handbook of Disaster Research. New York: Springer.

Chang, F.C., Wallace, J.M., (1987). Meteorological conditions during heat waves and droughts in the United States great plains. Monthly Weather Review. 115 (7).

Dai, A. (2010). Drought under global warming: a review. WIREs Climate Change 2. 45-65.

Gerrity, E.T., and Flynn, B.W., (1997). Mental health consequences of disasters. In: Noji, E.K., (ed.) The Public Health Consequences of Disasters. New York: Oxford University Press, 101-121.

Hellmuth, M.E., Moorhead, A., Thomson, M.C., Williams, J. (Eds.), (2007). Climate Risk Management in Africa: Learning from Practice. International Research Institute for Climate and Society (IRI), Columbia University, New York, USA. 3-23

Hennessy, K., et al., (2008). An assessment of the impact of climate change on the nature and frequency of exceptional climatic events. Drought Exceptional Circumstances. Australian Government, 3-13

Hansen, J.W., Dilley, M., Goddard, L., Ebrahimian, E., Ericksen, P., (2004). Climate Variability and the Millennium Development Goal Hunger Target. IRI Technical Report No. 04. 3-6

Huschke, R.E., (1959). Glossary of Meteorology. American Meteorological Society, Boston. (available online at: http://glossary.ametsoc.org/wiki/Drought, access date: 06-02-16)

International Research Institute (IRI) for Climate and Society. (2001). The Drought and Humanitarian Crisis in Central and Southwest Asia: A Climate Perspective, IRI Special Report. 01–11.

Kakar, zainuddin (2020). "Material science and engineering" IOP Science. April 2, 2020. https://iopscience.iop.org/article/10.1088/1757-899X/414/1/012013/pdf

Khan, M.A., Gadiwala, M.S., (2013). A study of drought over Sindh (Pakistan) using standardized precipitation Index (SPI) 1951 to 2010. Pakistan Journal of Meteorology. Vol. 9(18). 16-20

Le Comte, D., (1994). Weather highlights around the world. Weatherwise. 47. 23-26.

Le Comte, D., (1995). Weather highlights around the world. Weatherwise. 48. 20-22.

Mazhar, N., Nawaz. M., Mirza, A.I., Khan, K., (2015). Socio-political Impacts of Meteorological Droughts and their spatial patterns in Pakistan. Research Journal of South Asian Studies. 30 (1).

Pérez L. Pérez, y, Hurlé J. B., (2009). Assessing the socio-economic impacts of drought in the Ebro River Basin, Spanish Journal of Agricultural Research. 7(2),

Pérez L. Pérez, y, Hurlé J. B., (2009). Assessing the socio-economic impacts of drought in the Ebro River Basin, Spanish Journal of Agricultural Research. 7(2),

Shiferaw, B., Tesfaye, k., Kassie, M., Abate, T., Prasanna. B.M., and Menkir.A., (2014). Managing vulnerability to drought and enhancing livelihood resilience in sub-Saharan Africa: Technological, institutional and policy options. Weather and Climate Extremes. 3,70-71

Shaw, R., and Nguyen, H., (2011) eds. Droughts in Asian Monsoon Region. Community, Environment and Disaster Risk Management, 8. Bradford, GBR: Emerald Insight, 2-3

United Nation Development Program (2015), "The SDGs In Action," United Nation Development Program, Octobar 25, 2015:24-36. https://www.undp.org/sustainable-development- goals.

Wilhite, D.A. (2000). Drought as a natural hazard: Concepts and definitions. In: Wilhite, D.A., (Ed.), Drought: A global assessment (pp. 3– 18).London: Routledge. In: Shaw, R., and Nguyen, H., (2011). Eds. Droughts in Asian Monsoon Region. Community, Environment and Disaster

William M. Lafferty, and Katarina Eckerberg (1998), From the Earth Summit to Local Agenda 21: Working Towards Sustainable Development (Washington: Earthscan, 1998).

Zahid, M. and Rasul, G. (2012) Changing Trends of Thermal Extremes in Pakistan. Climatic Change, 113.

********

## Annexure - I

## QUANTITATIVE SURVEY

## Questionnaire (Closed-ended)

Name: (Optional) _____ Gender: _____

Qualification: _____ Occupation: _____

Place of Birth
(City, Province) _____

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| 1. Do you think that Apple crop is the most cultivated crop in the Quetta City? | | | | | |
| 2. Do you think that Apple crops needs more water comparable to other form of vegetation? | | | | | |
| 3. Is subsidies in the power sector and installation of high power motors are commendable? | | | | | |
| 4. Do you think that Balochistan Ground Water Administration Ordinance, 1978 has been violated? | | | | | |
| 5. Do you agree that orthodox and condemned methods of water abstraction are creating water scarcity in Quetta city? | | | | | |
| 6. Can droughts management authority be blamed for water scarcity? | | | | | |
| 7. Do you think that an efficient and proactive management is needed for the conservation of water resources? | | | | | |
| 8. Falling ground water is cost ineffective as well as the quality of water is deteriorating? | | | | | |
| 9. Do you think declining ground water is due to increasing population? | | | | | |
| 10. Do you think that Quetta became over-populated in the last decade? | | | | | |
| 11. Do you think that livestock has denatured alarmingly in the last decade? | | | | | |
| 12. Do you think that poor sanitation and scarcity of water results in the endemic diseases and other health issues? | | | | | |

**********

## Annexure - II

## QUALITATIVE INTERVIEW
## Questionnaire (Open-ended)

Name: (Optional) _____ Gender: _____

Qualification: _____ Occupation: _____

Place of Birth
(City, Province) _____

What are the cultivation patterns in the suburbs of Quetta city?

_____

_____

_____

Can you identify the rate at which tube wells and pumps are installed in the vicinity of Quetta city?

_____

_____

_____

What are the reasons behind uncontrolled abstraction of water resources?

_____

_____

_____

Do you think that the sole responsibility of Government to conserve water resources?

_____

_____

_____

What are your comments on the livestock and agriculture of Quetta city?

_____

_____

_____

Comment on the relationship between health issue and water scarcity?

_____

_____

_____

********